



**Montana Videoconferencing Strategic Plan
Final Report
June 12, 2002**



Sponsored by the
Montana Information Technology Services Division (ITSD)
Brian Wolf, Chief Information Officer

Prepared by Federal Engineering, Inc.
Fairfax, VA.

www.fedeng.com



Montana Videoconferencing Strategic Plan

Introduction.....	4
Executive Summary:.....	6
Acknowledgements.....	9
Overview of Project Methodology.....	10
Stakeholder Involvement.....	10
Supplier Meetings.....	11
Results of the Needs Assessment Process.....	12
Analysis of Client Requirements.....	12
Department of Transportation.....	12
Higher Education.....	13
Department of Corrections.....	13
Courts.....	14
Office of Public Instruction.....	15
Legislative Services.....	15
Department of Military Affairs.....	16
Video Forum Results.....	17
ITSD Needs.....	18
Analysis of the Current METNET Environment.....	20
Current METNET Utilization.....	20
METNET Videoconferencing Equipment Technology.....	22
Bridging Capabilities.....	25
Scheduling and Monitoring Software.....	26
METNET Network Technologies.....	26
Current End-to-End Configuration.....	27
Network Topology Changes.....	27
Anticipated Growth.....	31
Supplier Environment.....	32
Network.....	32
Videoconferencing Equipment.....	33
Interoperating Networks.....	34
VisionNet.....	35
Eastern Montana Telemedicine Network.....	36
National Guard.....	37
Other Providers of Note.....	38
Provider Partnering.....	39
Process Analysis.....	41
Operational Processes.....	41
Costs and Chargeback Processes.....	42
Comparisons/Best Current Practices.....	45
North Dakota.....	45
South Dakota.....	45
Indiana.....	46
Wyoming.....	46
Louisiana.....	47
Other States.....	48
Summary.....	48
Recommendations.....	52

Montana Videoconferencing Strategic Plan

Videoconferencing Equipment Technology.....	52
Networking.....	56
Policy.....	60
Process/Organization.....	61
Conclusions	65
Appendices.....	67
Appendix A.1 - Utilization Hours by Site.....	68
Appendix B.1 - Community Comparison of Services.....	70
Appendix C.1 - Cost Burden and Service Fee Comparison.....	74
Appendix C.2 - Operational Function Comparison.....	76
Appendix C.3 - Scheduling Process Comparison.....	78
Appendix C.4 - Technical Statistics Comparison.....	81
Appendix D.1 - Videoconferencing Benefits.....	82
Appendix E.1 - Video Forum Small Group Comments.....	89
Appendix F.1 - Comparison of ISDN and IP for Videoconferencing.....	92
Appendix G.1 - MCU Feature Comparison.....	93
Appendix H.1 - Scheduling and Management Software Vendor Comparison.....	94
Appendix I.1 - MDT Locations with Comparative ATM Hub Locations.....	95
Appendix J.1 - Non-Profit Videoconferencing Providers in Montana	96
Appendix K.1 - Considerations for Outsourcing Decisions.....	98
Appendix L.1 - METNET Site Upgrade Cost Estimate.....	100
Appendix M.1 - Implementation Process.....	102
Appendix N.1 - Current METNET configuration.....	103
Appendix N.2 - Current Migration Plan.....	104
Appendix N.3 - Bridging <5 sites, on PBX.....	105
Appendix N.4 - Bridging, 5+ sites, on PBX.....	106
Appendix N.5 - Bridging, <5 sites, off PBX.....	107
Appendix N.6 - Bridging, 5+ sites, off PBX.....	108

Montana Videoconferencing Strategic Plan

Introduction

In February 2002 the Information Technology Services Division (ITSD) for the State of Montana initiated a project with Federal Engineering, Inc. of Fairfax, VA to develop a strategic plan for videoconferencing services for the state. Several issues drive the need to complete the plan now, including:

- The existing contract for purchasing new videoconferencing equipment expires in June 2002 and cannot be extended.
- The existing equipment base is aging and in many cases has been declared at “end of life” by the manufacturers, making maintenance and spares management more costly and difficult.
- Two agencies expressed the need for significant growth in the use of videoconferencing, including establishing several new videoconferencing service locations across the state.
- A new standard, H.323, has been established for videoconferencing over Internet Protocol (IP) networks. The state wants to determine the potential application of this new standard, and what new equipment is used on it, to the future METNET environment.
- The recent passage of Senate Bill 131, establishing ITSD’s role as the supplier of Information Technology services to the agencies of the State of Montana, reinforced the need to evaluate the potential market and needs for videoconferencing within the state’s agencies.

Further, the state wanted to explore the possibility of establishing a managed services arrangement to provide some or all of the videoconferencing needs, as well as to evaluate the degree to which ITSD should directly provide and support those services as they do today. The desire to evaluate a “hybrid” model was also expressed.

The project to develop the plan and provide recommended solutions to these issues was initiated in February 2002 with a kickoff conference call between the ITSD project team and **FE**. Following the kickoff, ITSD began collecting information for **FE** to use in analyzing the current METNET environment. A series of interviews were conducted with several key agencies during the week of March 4-8, including the Montana Department of Transportation (MDT), the Courts, and the universities. A “Video Forum” was held on April 23, 2002 to provide the key stakeholders with:

- An overview of the project,
- A view of the current and future videoconferencing technologies and capabilities,
- The opportunity to express their needs, and
- The ability to provide input to the direction of the project.

Following the Forum, several additional interviews were conducted with agencies and suppliers, including the National Guard, Eastern Montana Telemedicine Network (EMTN), VisionNet, Qwest, NextiraOne, and the Office of Public Instruction (OPI). Follow-up interviews were held during the week of May 6-10 with Qwest and VisionNet to clarify issues raised in the first interviews.

Montana Videoconferencing Strategic Plan

The initial draft of this report was provided to ITSD on May 20, and a constructive, collaborative dialog has taken place during the finalization of this report and recommendations. **FE** presented the results of the overall study to ITSD on June 4, 2002 in Helena.

Montana Videoconferencing Strategic Plan

Executive Summary:

The State of Montana is about to set a new direction for the videoconferencing services provided by the Information Technology Services Division (ITSD) to its many stakeholders, including state agencies, higher education, and others. Federal Engineering, Inc. (**FE**) performed this study in collaboration with many participants across state government, the state university system, equipment and network providers, and interoperating videoconferencing network providers. It identifies future needs; recommends approaches to videoconferencing technology, network, and equipment; and suggests action plans for the state to follow to increase the utilization of these services across existing and new user groups.

The details of this plan will provide further detail in support of the following recommendations:

- **Continue to support current METNET services with ITSD staff.** The current METNET users indicate a high degree of satisfaction with the quality of videoconferencing services that are provided today. ITSD should continue to place emphasis on maintaining the high level of service provided today, and as it is expanded to new MDT locations. Continued emphasis should be placed on managing costs through this growth phase.
- **Establish H.323 as the future standard.** The state should establish a new set of standards for videoconferencing equipment and networking, based on the ITU H.323 standard of utilizing IP networks, particularly the SummitNet II network, for inter-location communications.
 - **Establish procurement capability for new equipment.** A short-term procurement effort should be initiated to provide the ability to procure this equipment as funding becomes available. As existing equipment is replaced, the new standards should be followed. Grant money and legislative/executive support for additional funding should also be aggressively pursued.
 - **Accelerate transition to SummitNet II.** The short-term implementation activities include acquiring dual mode equipment (compatible with both H.320 and H.323) and/or utilizing multiprotocol routers to enable the use of the videoconferencing equipment without passing through the PBX's, but still utilizing SummitNet II where it is available. However, the costs of moving the current H.320 equipment off the PBX are around half of what it would cost to replace all the H.320 equipment with H.323 equipment. The need to recapture the PBX capacity needs to be carefully evaluated in light of these costs.
- **Aggressively pursue interoperating with other service providers.** As new service locations are identified, the state should make every effort to partner with existing or emerging videoconferencing service providers to minimize the investment that the state would need to make in network and/or equipment. Utilizing these managed services

Montana Videoconferencing Strategic Plan

arrangements will help maximize the opportunity for private sector growth and hopefully provide a positive economic benefit for both the service providers and the state agencies. Of particular note are the VisionNet network and the emerging capability that the National Guard may offer, subject to security restrictions on access and use of their buildings.

- **Maintain control of key client interface processes.** The state feels strongly that ITSD should maintain control of the overall client relationship, including sales/marketing, billing, and overall client satisfaction. This is the case even if a “managed services” provider performs other aspects of their current responsibilities. Support for networking, operations, technical issues, equipment installation, and maintenance could be provided and managed by these external entities where appropriate. Strategic planning would be a shared responsibility.
- **Establish a trial program for “managed services.”** The state should utilize the videoconferencing requirements that the Courts have identified as an opportunity for evaluating the “managed services” approach. **FE** recommends that the state attempt, either through an RFP or an alternative procurement methodology, to engage a single videoconferencing service provider for these locations. It appears that the VisionNet network could serve more of the Courts locations than any other single network and that there would not be a significant price difference for the locations where both VisionNet and SummitNet II both have presence. It is expected that VisionNet will offer a viable solution but the state should be willing to consider alternative proposals. Since the usage patterns of the Courts are essentially self-contained, this offers a good opportunity to evaluate the processes, network capabilities, and interoperability of these sites in a “managed services” arrangement. From a contingency standpoint, if the managed services approach does not meet the Courts’ requirements, deployment under this arrangement could be stopped at any time and the Courts sites could be migrated to a state-controlled network environment. This “trial” approach would also give ITSD a good opportunity to test their critical client relationship, billing, and planning processes within a managed services environment.
- **Evaluate long-term choices for partnerships.** As the results of the trial of managed services become available, the state should evaluate the potential for migrating additional videoconferencing business, including existing METNET sites and other new growth, to a favorable supplier that has proven their ability to partner with the state. If the decision is in fact to outsource additional locations, the transition operational structure will be a “hybrid” model, with some METNET locations continuing to be managed by ITSD and other locations being managed by the service provider. These decisions will be location-sensitive, based on the availability and cost of network facilities and the overall value proposition that the service provider creates for the state.

Montana Videoconferencing Strategic Plan

- **Revise the chargeback process for METNET services.** The chargeback model for METNET services should be revised to establish a two-tier approach – a subscription basis for regular users and a ‘pay-as-you-go’ basis for occasional users.
 - The subscription fees would be negotiated based on historical agency/educational institution usage and would, in the aggregate, cover the fixed costs of ITSD’s support for videoconferencing services. Each agency could utilize existing METNET sites or could establish dedicated sites for their use. If there are other agencies nearby, the “owning” agency could establish a fee basis to allow use of their dedicated facilities by those agencies.
 - The usage fees would be market-based, utilizing quarter-hour pricing increments, and should be more attractive than private sector alternatives. Fees for interoperating with other networks would also fall into this category. This alternative would be attractive for agencies that do not have sufficient demand to justify a subscription/dedicated service. Existing METNET rooms would be the most likely delivery points for this alternative approach.
 - The site-based equipment, maintenance, and local onsite support would be funded by the local agency. ITSD could facilitate ‘sharing’ agreements where appropriate, for both intra-government agencies as well as for the use of state-owned property by external service providers to the private sector. Obviously, grant funding and/or legislative authorization beyond the normal operating budget will facilitate the technology migration.
- **Understand detailed client requirements and develop videoconferencing solutions.** The state should implement an aggressive education and marketing initiative to increase the awareness of the benefits of videoconferencing, as well as the potential savings in travel costs and employee productivity. Also, implement a statewide video council that engages existing clients as well as other public sector representatives.
- **Implement stronger supplier management processes.** The state should accelerate its efforts with Qwest to define the specific capabilities of the SummitNet II ATM network, particularly in terms of how the necessary Quality of Service (QoS) and network management parameters (use of IP Precedence, DiffServ, RSVP, and MPLS) will be handled once H.323 videoconferencing is using the network. As the ability to implement Network-to-Network Interfaces (NNI) with other interoperating ATM networks (such as VisionNet, in the short term and Savvis, over the long term), this will become even more critical to understand and have a clear definition of specifications, roles and responsibilities. The state should also continue to exert influence on Qwest to deploy Switched Virtual Circuits (SVC’s) and to provide additional ATM network access points in Montana.

Montana Videoconferencing Strategic Plan

Acknowledgements

The development of this report has been a highly collaborative effort and has included the gracious and cooperative efforts of many people associated with videoconferencing in Montana. Federal Engineering wishes to acknowledge the support and participation of the following individuals, and apologizes in advance for anyone whose name may have been inadvertently omitted:

ITSD

Penne Beto
Jeff Brandt
Tony Herbert
Carl Hotvedt
Tom Murphy
Dawn Pizzini
Jim White
Rick Wine
Brian Wolf

MDT

Jerry Dupler
Linda Francis
Barbara Martin
Tom O'Sullivan

University Systems

Ray Ford U of M
William Marcus U of M
Tom Morrison MSU
Kim Obbink MSU
Mark Sheehan MSU

Corrections

Dan Chelini
John Daugherty

Military Affairs

Colonel Mike McCabe
Major Chris Perez

Courts

Dan Chelini
Sherry Meador
Kay Richards

OPI

Scott Busswell
Michael Hall
Steve Meradith

Legislative Services

Steve Maly
Lois Menzies
Hank Trenk

EMTN

Thelma McCloskey-Armstrong

VisionNet

Kris Harrison	Wayne Vick
Corey Jensen	Terry Kimmet
Mike Sheard	Rob Farris
Mike Strand	Darrell Ogg
Ron Warnick	

NextiraOne

Jerry Jessop
Dave Poss

Qwest

Doug Bermingham	Dennis Luttrell
Keith Lyson	Michelle Burchett
Sharon Stockstad	

Montana Videoconferencing Strategic Plan

Overview of Project Methodology

Since 1992, the Information Technology Services Division (ITSD) has served the interests of higher education and state government entities by offering two-way video and audio conferencing. This service called the Montana Educational Telecommunications Network (METNET) encompasses 22 sites in 13 Montana communities, with the additional ability to connect nearly anywhere in the world by interfacing with global network service providers. However, several factors hold significant influence in determining the future of video services throughout the state and education entities in Montana. These factors include:

- Much of the video equipment in the METNET system is at or near the end of life.
- The current contract to purchase new equipment expires at the end of June 2002.
- Senate Bill 131 provides incentive for an enterprise wide solution leveraging the collective strength of multiple state entities.
- A wide and growing base of public and private video networks exists across the state.
- There has been a significant increase in customer interest and demand for video services.
- SummitNet II provides state agencies with a scaleable network backbone for running data, voice and video.
- The maturing H.323 videoconferencing standard presents a convenient way for transporting video services over the data networks used in most local environments.

To help analyze these issues, ITSD contracted with Federal Engineering, Inc. (**FE**) to develop a set of recommendations around a selected strategic operational model. The approach used to select the operational model and provide the recommendations presented in this report took a three-step process including needs assessment, infrastructure review, and analysis leading to conclusions and recommendations.

Stakeholder Involvement

During the needs assessment step a primary focus was placed on gathering information about statewide business needs through small group interviews with state government agencies, higher education organizations, and the Office of Public Instruction to represent the K-12 interests. ITSD selected the interview participants, and participated in the interviews along with **FE**. In addition to the interviews an all day Video Forum meeting was held on April 23, 2002 for representatives from most state agencies and potential suppliers. During this forum, valuable comments and reactions were obtained from the interaction of current and potential users of videoconferencing services.

Another critical part of the assessment and infrastructure review process was to gather information about the technical landscape of equipment and network currently used to provide videoconferencing services including detailed technical information on each of the METNET sites, SummitNet circuits, and other videoconferencing providers throughout the state.

Montana Videoconferencing Strategic Plan

Supplier Meetings

To round out the infrastructure review process, supplier meetings were arranged to discuss current and future capabilities. Specifically, NextiraOne, VisionNet, and Qwest were interviewed. **FE** explored the desire and capabilities to provide videoconferencing equipment, network, and services to the State of Montana.

Results of the Needs Assessment Process

During the course of this study, *FE* surveyed users to determine the immediate and future demand for videoconferencing services. From the course of these interviews, three high-demand market segments emerged: the State University users, the Department of Transportation, and the Courts. In addition to these users, a myriad of other state entities identified the need for convenient, efficient, and practical videoconferencing services.

Analysis of Client Requirements

The following agencies were interviewed as part of the Needs Assessment process and provided the information below:

Department of Transportation

The Montana Department of Transportation (MDT) is one of the largest state agencies and is organizationally comprised of six divisions and five districts strategically located across the state. Division offices are located Bozeman, Havre, Kalispell, Lewistown, Miles City, and Wolf Point. District offices are located in Billings, Butte, Glendive, Great Falls, and Missoula. Central headquarters is located in Helena.

The Department of Transportation envisions videoconferencing services serving the business and performance needs of several regularly occurring and impromptu meetings. Interviewees from the department expressed eagerness and commitment to the technology with budgetary commitment, operational support and managerial buy-in. Requirements for the systems include a high priority on convenience and availability. The main office located in Helena hosts a videoconferencing site that was implemented in 1998 primarily to provide distance education for MDT employees and communication on the TEL 8 network providing connection to several other states. While the magnitude of the initial use of this system is unknown, there is essentially no METNET use of this facility by MDT at the current time.

From a business strategic planning perspective, the Department of Transportation has targeted four critical success factors using a balance of perspectives in the areas of financial consideration, customer satisfaction, business process improvement, and stable well-trained work force. Specifically, interviewees expressed a desire to reduce time spent in travel, reduce cost of travel, increase quality of life for employees, and expand communications among teams. Integral to achieving strategic and tactical success is the ability to successfully use videoconferencing to facilitate several meetings. Applications discussed included administrative staff meetings, “plan in hand” meetings, training, interviews, district construction meetings, pre-construction meetings, and public hearings. As an example, full-day administrative meetings occur regularly every six weeks, requiring individuals to travel from the district and divisional offices to the meeting location in Helena. These meetings present inconvenience to the individual, loss of productivity, financial expense to the organization, and restrict meetings to managerial representatives without being able to easily tap resources within the workforce for first-hand clarification.

Montana Videoconferencing Strategic Plan

Higher Education

With locations across the state and in major population centers, Universities and Community Colleges have been pioneers in the use of videoconferencing within the State of Montana and comprise the largest single use of current METNET traffic. Courses are offered in nursing, engineering, computer science, business, and pharmacology. Specifically the Nursing and MBA programs provide a large amount of “repeat business” based on the success of videoconferencing in these programs. Geographic coverage of systems includes Billings, Boulder, Butte, Dillon, Great Falls, Havre, Helena, Kalispell, Miles City, and Missoula.

While the Universities are committed to continuing with distance education, and are extremely pleased with the level of customer service, the interviewees expressed a concern regarding the price of services. The METNET fees are passed to the students who are taking the classes by videoconferencing. This can cause a significant financial burden to the participants, on top of tuition fees, if there are not a large number of students enrolled in a particular course. Therefore, in addition to METNET services, other services for providing education at a distance are being explored and piloted. Of note is the testing of Internet 2 services. These services are currently funded with grant money and therefore do not incur any additional costs to the student. This is likely to cause some decrease in the use of METNET services being used by the institutions that have access to Internet 2, for at least as long as grant funding continues to be available for Internet 2. However, it is important to note that the reach of Internet 2 is not as extensive as METNET within Montana and therefore should not see a rapid decline in METNET services over the next few years.

Department of Corrections

The Department of Corrections has successfully used videoconferencing to provide telepsychiatry services to inmates and had some success in piloting hearings between the correctional facility and the courthouse. In addition to those experiences, videoconferencing services are seen as being able to aid several functions to save time and expense. Deployment of videoconferencing services is limited at this point and information technology budgetary commitment is directed to efforts with higher priority.

Geographic reach of videoconferencing services to state facilities include a men’s facility, a women’s facility, and three other correctional facilities served by DS-1 service on the SummitNet II state network. Use of videoconferencing by the parole office would include these facilities and operate in Glendive, Billings, Kalispell, Missoula, Great Falls, and Helena. Additional use was mentioned in the interviews for staff in Miles City, the Pine Hill School for Juvenile offenders, and in county jails for services such as parole hearings, arraignment hearings, educational classes, training, and telehealth services. Of the most critical success factors discussed by representatives from the Department of Corrections, cost will play a vital role in determining the priority and provision of videoconferencing services to meet the applications discussed.

Montana Videoconferencing Strategic Plan

Of significant note are the time, expense, and risk incurred in transporting a prisoner from either a state or local facility to state court. This takes one or two correctional officers anywhere from one hour to two full days, incurring a loss of productivity and significant travel costs. While the internal budgetary process, as it was explained to **FE**, does not easily handle moving funds from a "travel" or "salary" account to a "technology" account, it is expected that there would be substantial savings to the organization by utilizing videoconferencing for this function. In addition to the cost savings, the use of videoconferencing minimizes the security risks to the public, the Corrections employees, as well as to the prisoners. Among the possible drivers for a rapid deployment of videoconferencing is the result of the State of Montana v. Giddings and Goebel. It is estimated that nearly 1000 case files need to be reviewed. In this process inmates may need to be interviewed which today would require prisoner transport services. Videoconferencing offers a very cost-effective and timely solution to this issue.

Courts

Several entities within the Courts system in Montana have been able to pilot videoconferencing, funded under grants for programs dealing with services provided in juvenile cases. These pilot programs, located in Billings, Missoula, and Miles City, have successfully demonstrated proof of concept and the Courts are looking to expand the reach of services.

Specifically, three entities have provided the momentum for the videoconferencing deployment today. The Court Assessment Program (CAP) with a pending grant of \$500,000, the Juvenile Probation Officers Association (JPOA) with a grant of \$450,000, and Montana Legal Services funded in part from National Legal Services have each purchased Polycom equipment and leased lines from VisionNet to support their services over videoconferencing. Interviewees see the greatest benefits and success factors for videoconference users in providing greater access to the Courts, more and better attorney-client communication, reduced physical risk for judges by reduction of driving requirement, and increased quality of life for judges. In the near term, JPOA and CAP are looking to expand to at least the 22 district courts with the ideal deployment to all county courts and jails in 56 county seats. Additional deployments could include the crime lab, three juvenile detention facilities, and the Attorney General's office. Specifically, **FE** was told that JPOA has a window to spend funds on equipment by September 30, 2002.

Several challenges were explored during the interview and primarily encompass operational and budgetary issues. Most of the grant funds are targeted for equipment purchase; however, this grant funding is also supporting the operational requirement for telecommunication circuits. Scheduling mechanisms and requirements have not been formally defined which will become more difficult with an increased base of deployment. Some judges are not comfortable with the technology and some are more agreeable to it. This causes a disparity in user function and requires operational assistance issues to be worked out on a local and individual level. Also, there are little or no technical resources available at all the target deployment locations to deal with any technical difficulties.

Montana Videoconferencing Strategic Plan

Office of Public Instruction

The K-12 school system in Montana is comprised of 450 school districts with approximately 870 schools operating autonomously. While VisionNet deploys videoconferencing in many high schools, OPI has no authority or commitment to get feedback from the schools regarding actual usage of these systems.

For functions with the Office of Public Instruction (OPI), videoconferencing serves training requirements by using shared purpose facilities with METNET being the service of choice. OPI representatives greatly value the quality of customer support through operator assistance on the METNET service. Additionally, they report occasional compatibility issues when using a combination of METNET and VisionNet sites, attributed technically to a proprietary out of band control for VisionNet systems.

OPI would like to use videoconferencing more to provide training throughout the state. From a budgetary standpoint it is easy to see how videoconferencing can make the dollar stretch farther than with the cost of travel to offer the same training to the same number of locations. However, OPI interviewees did express concerns regarding the challenges of using both METNET and VisionNet services.

Also encumbering the ability to plan conferences throughout the year is the room reservation policy that excludes OPI from reserving a METNET room more than 90 days in advance. Scheduling of VisionNet sites usually takes too long to get a confirmation because of the need to verify room availability with each local entity. If a mixture of METNET and VisionNet sites is used, there is a disparity in the level of operator support and this makes it difficult to deal with operations such as muting microphones and panning the camera. Another inconvenience is that not all spaces are set up with the flexibility to move around and work in breakout groups.

OPI also made note that they are looking into video streaming technologies to help distribute training and management information but not curriculum. Examples include information and instruction for completing program reports and financial funding reports.

Legislative Services

Through the Montana Television TVMT initiative, Legislative Services intends to use video in a variety of ways. TVMT is the state public affairs television and Internet broadcasting service established through House Bill 144 by the 57th Legislature in 2001. Of primary importance to this initiative is offering television coverage of the 2003 session of the Montana Congress over closed circuit, public broadcasting, cable companies, and possibly audio streaming to the public Internet. The primary goal of the TVMT program is to reach as many people as possible with gavel-to-gavel coverage. Eventually, TVMT would like to offer year-round coverage for legislative hearings and other matters of legislative interest. The commitment to offer wide access is highly valued and therefore interview discussions focused around ways current videoconference technology could offer assistance or value to the TVMT initiative. While not needing to be used as in interactive site, the VisionNet sites provide a good coverage area for reaching constituents. As an added bonus, these sites

Montana Videoconferencing Strategic Plan

could also be used for interactive conferences between clusters of constituents and congressmen.

Near term interactive needs include meetings between congressmen and constituents and possibly participation in statewide hearings. It was noted that a METNET system formally resided (now located at the Department of Health and Human Services) in the state capital and was used successfully by small groups of congressmen in Helena to constituents in Billings. The success of this endeavor rested on having internal champions for the process and the convenience of a co-located system. Legislative Services expressed a desire to offer constituents more opportunity to interact with the legislative process by being involved in the hearings that occur while the legislature is out of session. One avenue to do this is a well-moderated videoconference.

In the future, the use of videoconferencing could be the transmission medium used to create a virtual legislature meeting in the event of local or national disaster. Since this application is merely a speculation, it is recorded here merely for completeness.

Department of Military Affairs

The Army National Guard is involved in a federally funded project to provide Distance Learning to all the armories in the State of Montana. They are connecting nationally to other Guard sites across the US but see a wealth of benefit for extensively using and sharing the video network within the State of Montana. At present, the Montana Army National Guard is ramping up from two to 28 sites dispersed in 22 communities. Videoconferencing is planned for armories located in Libby, Kalispell, Missoula, Hamilton, Anaconda, Dillon, Butte Helena, Great Falls, Havre, Chinook, Lewistown, Harlowtown, Bozeman, Livingston, Billings, Glasgow, Malta, Miles City, Glendive, Sidney, and Culbertson. Connection to each armory is provided with ATM DS-1 service out of a hub in either Helena or Bozeman and purchased through the state SummitNet II contract. Half of the service bandwidth is dedicated for video with the other half for data.

Conceptually, the Guard is willing to provide shared use of their systems at reasonable rates to the local community users. Logistically, there may be some restrictions based on physical building access or limitations to provide service in accordance with the Americans with Disabilities Act.

Representatives from the Guard expressed their need and desire to address challenges with the ongoing, long-term operation of the network. For now, operations support is handled by Guardsmen with a three tiered technical support provided by EDS. As a matter of operations policy, only content originating sites require a system operator. Content receive sites are operated by persons at the receiving site audience. Scheduling is accomplished through a national scheduling system developed for and used by the National Guard throughout the country. The Montana National Guard intends to buy a bridge to provide multi-point capabilities within the state.

Montana Videoconferencing Strategic Plan

Video Forum Results

On April 23, 2002, a Video Forum was held with approximately 65 people from most stakeholder groups and supplier organizations attending. The purposes of this session were to:

- Provide a common understanding of videoconferencing technologies, terminology, planning and operational issues
- Provide an overview of how videoconferencing is done today using the capabilities of the Montana METNET
- Share some success stories from stakeholders who have had positive experiences utilizing videoconferencing and METNET
- Provide the opportunity for stakeholders and suppliers to describe their needs and concerns for videoconferencing for the future

In order to accomplish the last item, the group was divided into four sub-groups and was asked to report on their discussion surrounding the following questions.

- What are the most likely applications for videoconferencing for my organization?
- What are the biggest benefits to my organization of using videoconferencing?
- What are the most likely obstacles to my organization using videoconferencing?
- What alternatives should be considered for pricing videoconferencing? What do you see are the trade-offs between fixed pricing and usage based pricing?

The following represents a summary of the various groups' findings:

- The most likely applications for general agency use were identified as meeting and conference replacements, employee orientation, employee skills training, human resources uses such as job interviews, and testimony to the Legislature.
- The education-centric group specified distance education as a major focus, in addition to parent conferences, staff meetings, streaming video for education, K-12 education, guest speakers, virtual incubator, student collaboration, and grant administration.
- The court-centric group suggested use of videoconferencing for judges meetings, settlement reviews, expert witness and crime lab testimony, arraignment hearings and sentence review.
- The group described as the business services divisions, suggested license board meetings, discipline hearing of licensees, training of building inspectors or staff, national group board meetings, and continuing education with out-of-state instructors.

Montana Videoconferencing Strategic Plan

- Benefits were described by all groups as increase in productivity, decreased travel costs, reduced geographic barriers, uniform delivery of content to all sites, training frequency, larger group participation in meetings and worldwide communications.
- Barriers to effective video teleconferencing mentioned include capital equipment costs, justification of videoconferencing service expenses, quality of video image and audio quality, funding restrictions (transfer of travel funds to videoconference uses), lack of on-site technical support and location and availability of present sites.
- Pricing alternatives suggested included a tiered rate schedule, flat monthly fees, volume pricing, different levels of support for different prices, legislative relief for VTC services, local payment of support personnel, discounted rates for educational institutions and subscriptions.

A transcribed list of the actual outputs from each group is included in Appendix E.1.

ITSD Needs

As the state contract to purchase videoconferencing equipment expires at the end of June 2002, ITSD has a pressing need to have a strategic and tactical direction for dealing with increased customer demand for videoconferencing services. The current distribution of METNET equipment does not meet the apparent rising demand for dedicated equipment resources in the locations anticipated by MDT and the Courts. In addition, much of the current METNET equipment is becoming increasingly more difficult to support with equipment nearing or reaching end of life cycle. These motivational drivers provide the impetus to see that new contracts or support mechanisms are secured in a timely manner.

ITSD is committed to supporting the policy expressed in Senate Bill 131 that indicates, "in order to minimize unwarranted duplication, similar information technology systems and data management applications are implemented and managed in a coordinated manner." Therefore, ITSD leadership has expressed the need to thoroughly understand the underlying business needs of state agency videoconferencing users in order to develop a strategic direction for service delivery in a high quality and cost-effective manner.

To accomplish this, senior ITSD leadership expressed that successful delivery of videoconferencing services to the state stakeholders rest upon a few important factors. Any solution will need to:

- Meet or exceed service level expectations
- Provide full interoperability with other standards-based video networks within Montana and with long-distance suppliers for out-of-state or off-network conferences
- Provide services at a cost lower or equal to commercial service
- Move all video services off the PBXs

These goals are incorporated into the planning process that **FE** has developed and help shape the recommendations that are included in this report.

Montana Videoconferencing Strategic Plan

ITSD leadership also indicated that they would consider a managed services solution, but feel strongly that the responsibility for client satisfaction, billing, and planning would need to remain within the ITSD organization.

Analysis of the Current METNET Environment

Provision of videoconferencing services that support state agency business and distance education requirements is at a crossroads. The current utilization of videoconferencing has grown mostly from use by a small percentage of state agencies and out of the specific requirements of higher education entities. However, near-term requirements from two stakeholder groups – Courts and MDT - forecast a significant increase in utilization and an expansion of demographics. Additionally, application requirements and changes in videoconferencing equipment technology generate different implementation considerations than those used in the past. Further, the underlying technical implementation is complicated by a change in networking methods for handling state voice and data traffic and maturation of videoconferencing standards.

Current METNET Utilization

FE gathered information on utilization from three sources, as follows:

- Detailed information provided by METNET staff identified the number and duration of calls by location, but does not break down the utilization on a per system basis in locations with multiple systems. This information is presented in Appendix A.1.
- Yearly utilization numbers used to track revenue were presented from two sources within ITSD. This information is consistent with those numbers presented in Appendix A.1 if the information in Appendix A.1 is annualized to match fiscal years used to track revenue.
- **FE** was provided with the projected utilization that was used in the FY 2003 budgeting process, to drive the cost recovery methodology. These projections are significantly different than the actual utilization numbers as provided above.

The primary concern that is raised by the differences in these numbers is the impact on the accuracy of the budgetary forecast and the potential over- or under-recovery that results from an inaccurate forecast. The FY 2003 budgetary forecast appears to be significantly higher than the current utilization levels, with no known adjustment for a new demand or customer. The trend over the past few years has been for decreasing usage, which adds further question to the forecast used in the budgetary process. If the forecast is higher than the actuals, it is likely that the current fee structure will not cover the direct and allocated costs. Based on a consistent level of use from FY 2002, it appears that the current rate structure will not cover the projected costs. It may be possible to mitigate that from occurring by postponing capital outlays that are in the FY 2003 projection. It is also possible that the unforecasted growth from MDT and Courts could help raise the revenue somewhat. But rather than continue to deal with these variables in this way, ITSD should consider negotiating 'subscription' pricing for unlimited network usage by their major clients. More information on this is provided in the Recommendations section.

Based on information provided by ITSD, and as is the case in most other state videoconferencing operations, the majority – about 70% - of current usage on METNET is

Montana Videoconferencing Strategic Plan

State University course offerings. These are typically a three- to five-site multi-point class originated from one location. Many instructors and presenters using the METNET system have come to expect the Annex-D capabilities, where a graphic (slide, Power Point Slide, PC chart, opaque picture, etc.) can be sent simultaneously during the presenter's discussion. Therefore, it is important that any changes in serving arrangements made by either the vendors or through changes in the technologies used, are able to accommodate that need. Some of the instructors (at the universities, in particular) are highly insistent about the availability of that feature, since they have used it so often.

The other 30% of METNET usage is split between various administrative types of meetings and includes participants from the universities, K-12, and state agencies.

As discovered and reported in the interview findings, two new major market segments are emerging, each bringing the expectation of heavy regular use of videoconferencing to increase productivity, facilitate more frequent communication, and reduce travel costs. These market segments are comprised of users from the Montana Department of Transportation (MDT) and from three areas within the Courts. The full extent and prediction of utilization of these systems has not been accurately quantified by these groups or by ITSD at this point in time, and will depend on the detailed application requirements and the adoption of the technology by the users. However, even if a conservative growth estimate is applied to both segments the utilization of videoconferencing services in the State of Montana will significantly increase over present METNET utilization.

An estimate of the utilization for the Montana Department of Transportation (MDT) can be done based on their plan to implement videoconferencing facilities in each of the State, District, and Division offices. This estimate, based on conservative estimates provided by MDT for use between one-half hour and one hour per day per site, result in an additional 1200-2400 conference hours of use per year, or an increase of between 15-30% over current baseline METNET usage.

Courts utilization at this point is less predictable as it may not necessarily be used at every site every business day. However, the potential exists for heavy usage. For the purpose of this analysis, conservative estimates have again been applied based on input from the agency. Organizationally, the state court system is comprised of 56 county courthouses in 22 judicial districts. Assuming that videoconferencing is used from one-half hour to one hour per day in each of 22 judicial districts the net increase is from 550 to 1100 hours per quarter, which corresponds to an increase of approximately 30% to 60% over current baseline METNET usage.

By combining estimates a potential exists to increase utilization from between 45%-90% above the average utilization of videoconferencing services provided by METNET sites today. This is a substantial increase of utilization and would incur a potentially large cost to scale the current network to accommodate the bandwidth required in each location, as the current plan is to provide 56Kbps service for data network connectivity, rather than the T-1 that would be required to support videoconferencing and the data network. Provided that the network design allows point-to-point calls, a minimal amount of additional resources from the centralized ITSD METNET support group would be required to support bridging and/or technical support.

Montana Videoconferencing Strategic Plan

METNET Videoconferencing Equipment Technology

METNET currently employs a mixed vendor product platform of equipment based on H.320, a standard for videoconferencing over telecommunication lines. Half of this equipment was purchased or upgraded within the past seven years. Eleven systems of the currently installed base that were installed prior to or during 1998 are built on core technology provided by CLI. In 1997, VTEL acquired CLI and has provided support for this older equipment but has not continued any development of the old CLI technology. Consequently, it is increasingly difficult to support CLI equipment as numbers of spares diminish. Figure 1 represents distribution in number of systems for the initial base listed by manufacturer and model while Figure 2 represents the distribution of the current installed base listed by manufacturer and model.

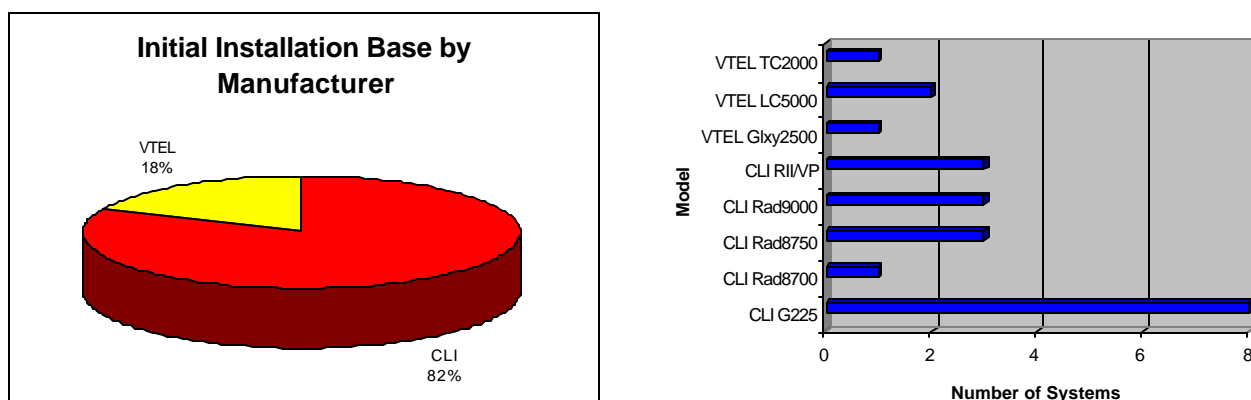
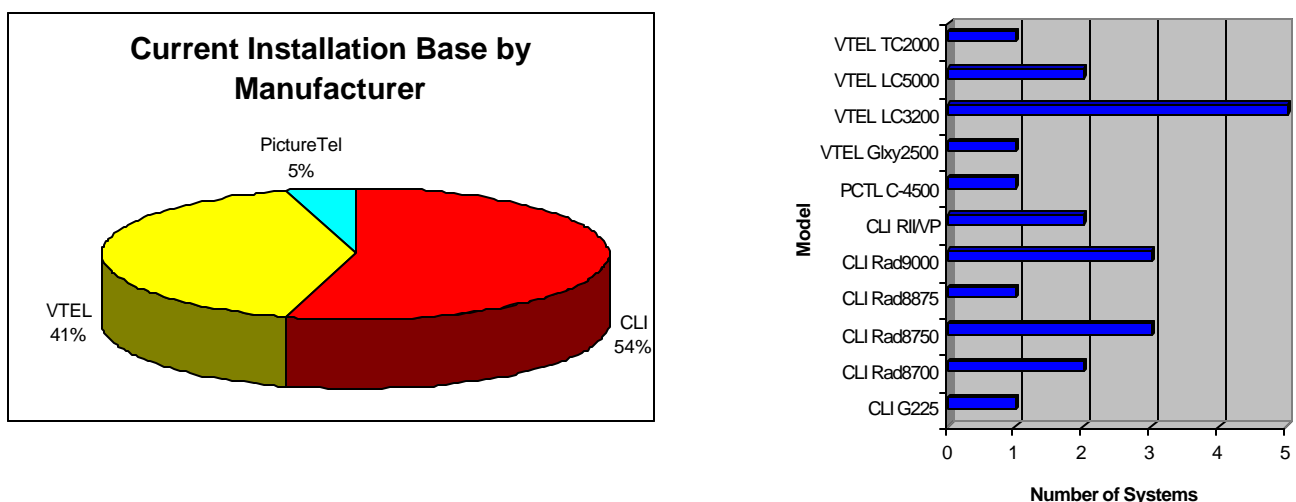


Figure 1 Initial and Installed METNET Equipment Base
Figure 2 Current METNET Installed Base by Year and Manufacturer



Montana Videoconferencing Strategic Plan

Installations of new systems and upgrades to systems have occurred throughout the past ten years. Figure 3 illustrates the systems installed and replaced by upgrades over the past ten years. This figure includes site at the Montana Department of Transportation which is considered here as a METNET location even though the current PictureTel system was acquired through an interstate consortium and placed on a separate network. It is included here for completeness and consistency with the technical information gathered in the course of this study.

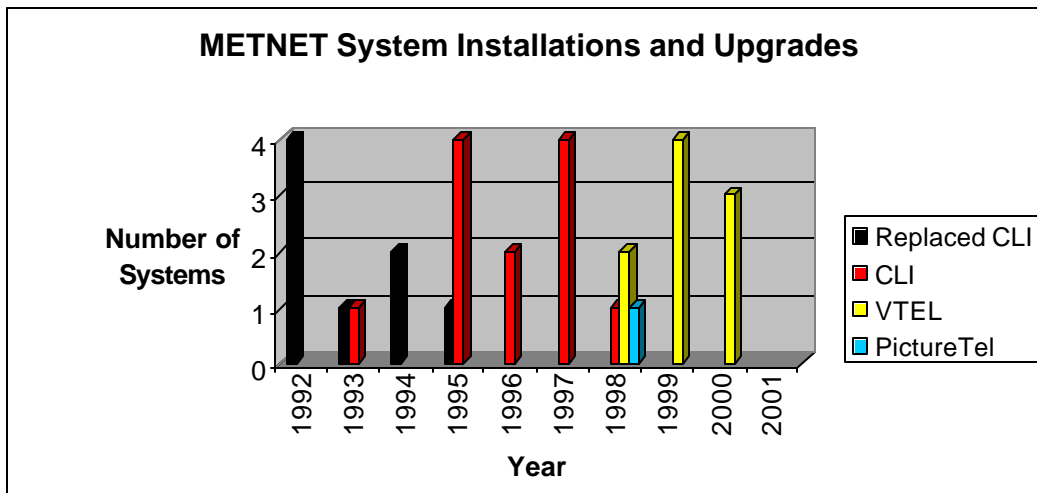


Figure 3 METNET System Installations and Upgrades

The METNET technical support staff estimates that the average METNET system downtime is less than 1%. While there is no mechanized tracking system for equipment or system troubles available to either the ITSD METNET staff or NextiraOne (responsible for onsite equipment maintenance), both ITSD and NextiraOne reported anecdotally that problems are resolved quickly and that the maintenance staff is generally responsive and resolves the issues in a timely manner. Additionally, for a majority of total system failures, the ITSD METNET staff has been able to work around critical issues in a manner acceptable to the client base, as indicated in anecdotal feedback from the clients. The ITSD METNET staff reports that most problems are either network related or due to tardy or absentee technicians.

With approximately 70% of METNET videoconferences and hours used by higher education, the technology used is geared to the distance education application. The majority of METNET sites are capable of receiving or originating course curriculum material. The technology for distance education takes into consideration larger groups of participants in well-designed learning spaces. The METNET learning spaces are dedicated rooms within buildings where space is at a premium. Some sites may use only a portion of the designed technology because they only receive content originated elsewhere. And in cases where this learning space is shared with other applications, the meeting space may feel big or awkward to the users not utilizing the space for distance learning. Some small consultant/patient interview spaces exist as well.

Montana Videoconferencing Strategic Plan

Tracking and trending utilization by agency, specific site identifier, number of hours, number and location of connected sites, and reason for the call will better equip ITSD and their clients with information useful in deciding priority in equipment upgrades. Utilization reported by location in Appendix A.1 reveals some locations use less than 50 hours of videoconferencing per quarter. These locations may be candidates for stimulating growth, if other communities of interest are nearby. Alternatively, it may be appropriate to close a site with very little usage and either redeploy the equipment to another site with higher demand or utilize the equipment for spares as the migration to H.323 takes place.

A more granular analysis of the utilization will reveal where videoconferencing is most effectively being used and therefore should bias the priority for upgrading those sites over less effectively used spaces. Further, some locations with higher utilization have multiple videoconferencing spaces. Detailed tracking within each of these locations with multiple spaces may reveal that there are few times when rooms are used concurrently for different videoconference needs. In this case, schools or state agencies may determine to streamline videoconferencing efforts by investing in an enhanced upgrade for fewer spaces.

Over the past decade, changes have occurred within the industry yielding a life cycle for videoconferencing equipment of around five years. Based on analysis of the data provided by ITSD, about half of the METNET equipment is over five years old and therefore is candidate equipment for replacement. Much of the remaining equipment is essentially at "end-of-life" from the manufacturer's standpoint.

Changes to videoconferencing technology over the past ten years include expanded feature sets as well as a shift in standards toward H.323. Most popular equipment today includes dual standard capability allowing the user to choose H.320 or H.323 for their installation and in some cases do both at the same time. Some new equipment geared toward the desktop or personal systems are solely H.323 standards based. As the incremental cost for systems with both standards is negligible, any change in equipment within the METNET system should include technology to accommodate both standards. In the same way, the migration plan for bridging equipment should also include dual standards as required to support the requirements of the installed base and through the proposed migration to H.323.

Other critical equipment used in providing METNET videoconferencing services include a 16 port Multi-point Control Unit (MCU) and a custom scheduling application with an interface to the telecommunications billing system. The MCU, also called a bridge, is utilized frequently for almost all calls made on the network including all of the multi-point calls and most of the point-to-point calls. With one of the 16 ports dedicated providing clock timing for the entire bridge, there are 15 ports to be used in any combination of calls. For example, the bridge can run three simultaneous five site calls or one call with all 15 endpoints. The custom scheduling/billing system was developed in house in 1993. The system creates a billing file used to populate the telecommunications bills sent out by ITSD.

Montana Videoconferencing Strategic Plan

Bridging Capabilities

Analysis of bridging capabilities and current practices to use the bridge to connect the majority of point-to-point calls indicates the MCU is sufficient for current utilization trends and can sustain limited growth within the H.320 conference standard. For example, if the University system is running a five site multi-point call, then ten other endpoints can be accommodated on the same bridge. This means that another five-site multi-point call is easily achievable with room left for two point-to-point calls. However, if a five-point University class is being offered at the same time as the anticipated MDT sites require a 12-site multi-point call, then capacity of the bridge is exceeded. Since the existing MCU has no inherent gateway capabilities any connection of H.323 sites will need to be run through either an external gateway or by using bridge-to-bridge connectivity with a externally owned and controlled bridge that can simultaneously hold a conference with both H.320 and H.323.

By nature, bridging technology follows the implementation trends of terminal equipment. As industry trend moves to moving more toward H.323 videoconferencing, so are the capabilities of conference bridges. Experienced manufacturers of videoconferencing bridges offer product lines with several feature capabilities. Companies such as Polycom (which acquired Accord), Ezenia (which carries former Videoserver equipment), and Avaya (which carries Lucent Technologies) have moved from manufacturing H.320 conference bridges to bridges that will support both standards. RadVision has utilized their extensive experience in the H.323 bridging and gateway products to develop a dual standard bridge. Only the Polycom product line has kept the same basic hardware platform throughout these changes.

The distinction in conference bridges today centers around the number of standards and features implemented. Most of the standards for multipoint conferencing have been stable with little development over the past couple of years and are not likely to change significantly. Conference bridges will continue to follow the implementation trends of the industry while adding features and options not yet incorporated in their present product lines. Each manufacturer sets its own priority of feature development in anticipation of gaining market advantage by picking the features that will best accommodate conference bridge owners. To illustrate where some of the top manufactures stand with current product feature development, the table in Appendix G.1 reports some of the major standards and features. This table includes both older and newer models offered by Accord, Avaya, Ezenia, and RadVision. As mentioned the shift in H.320 to H.323 will continue and product lines will continue to reflect this as a priority. Incorporation of H.323 architecture components such as gatekeeper functionality will be brought first to the higher end bridging equipment.

Costs for bridging equipment vary widely based on the scale and feature sets provided. On the low end of the scale are bridges with a rudimentary feature set allowing conferences of eight to 16 H.323 users to connect via a 100 Mbps Ethernet connection. On the higher end, fully featured bridges allow H.320, H.323, and H.321 users to connect via several types of network interfaces such as Ethernet, T-1, V.35 direct connect, and ATM. Feature sets of these higher end systems include elaborate continuous presence layouts allowing conference

Montana Videoconferencing Strategic Plan

participants to see several sites at the same time, and audio and video transcoding allowing conferences running different standards and at different data rates to interoperate. Lower end equipment starts at about \$4,000 per unit while high-end equipment can exceed \$400,000. A solid platform with desired features for METNET's needs and anticipated growth would likely cost between \$45,000 to \$85,000 for equipment, installation, and maintenance.

Scheduling and Monitoring Software

The scheduling software that METNET currently uses is sufficient for the workflow and process used today; however, **FE** feels that to reach further levels of efficiencies, ITSD should implement a more robust scheduling and management package with more user friendly features such as a graphical user interface and internet/intranet access. METNET staff will gain a unified scheduling and monitoring interface while users could gain the convenience of electronically scheduling their own MCU conferences. Further, automated reports available from this data will allow better analysis of process and technology issues as well as forming a basis for marketing analysis.

Popular scheduling and monitoring packages are provided by several third party vendors and from the videoconferencing manufacturers themselves. **FE** surveyed commercially available products from TODD Communications, Magic Soft, Forgent, Polycom, and TANDBERG. A summary of features can be seen in Appendix H.1.

In general, third party vendors will offer a greater range of equipment control by offering more types of equipment control than the vendor-specific packages. The vendor-specific packages offer a greater level of control and monitoring for their specific devices. Due to the complex nature of scheduling and monitoring several different types of equipment throughout the videoconferencing network, scheduling and monitoring software packages have been slow to develop but are becoming essential management tools for medium to large installation bases. According to a recent Wainhouse Research report, half of the users surveyed do not currently use a specialized management system, but 40% of users surveyed plan to implement one. Costs for management software ranges from the vendor specific software at the low-end with a range of \$1,500 to \$43,750 based on the number of sites supported. On the high-end, third party software starts at about \$20,000 and can range to over \$100,000.

METNET Network Technologies

The fundamental network architecture that supports METNET operations will undergo significant changes this year. By the end of June 2002, the state voice traffic is scheduled to transition from a T-1 backbone to an ATM backbone, provided by Qwest under the SummitNet II contract. The state has a number of choices concerning continued offering of videoconferencing services. Additional factors of influence include the maturing H.323 standard and the wide base of other videoconferencing service providers.

Montana Videoconferencing Strategic Plan

Current End-to-End Configuration

The videoconferencing system is comprised of a number of components including microphones, microphone mixer and audio equipment, cameras, television monitors or projection system, a control system, a CODEC (COder/DECoder), and an IMUX (Inverse MUltipleXer). The compression of audio and video signals is accomplished by the CODEC. The CODEC transmits and receives encoded signals via a connection to the IMUX that in turn is connected to a physical or leased T-1 line. Figure 3 details the typical connection described above. Once video traffic reaches the PBX, it is transmitted through the State Telephone Network depicted in Figure 4.

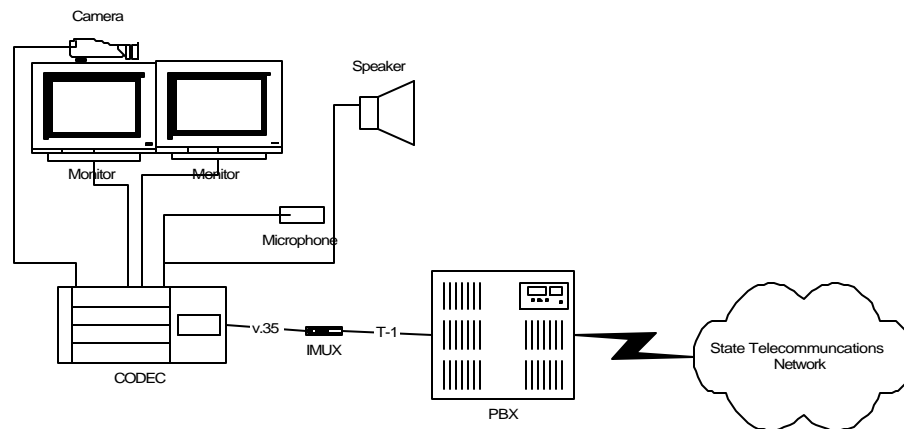


Figure 4 Typical Videoconferencing System Connecting to PBX

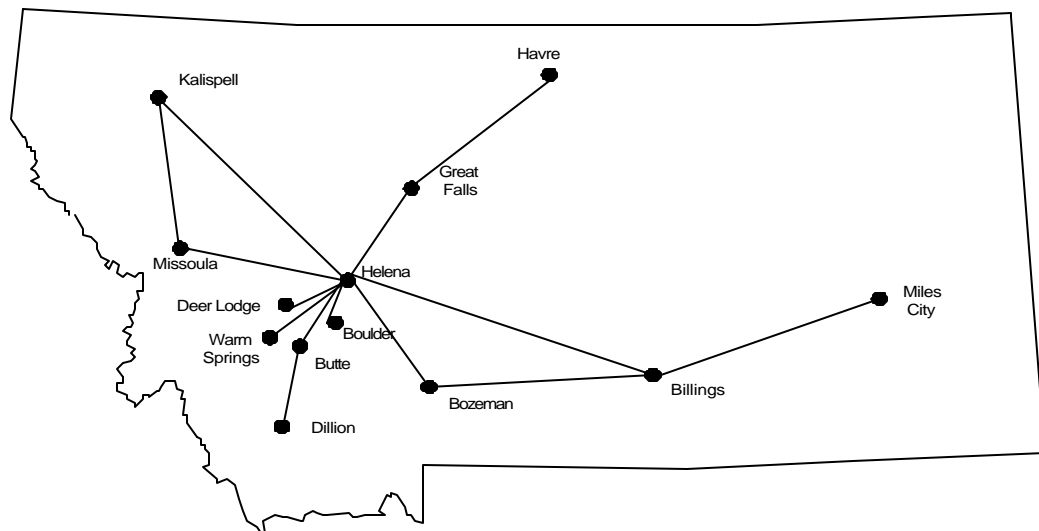


Figure 5 STN diagram (map of Montana w/backbone connectivity)

Network Topology Changes

It is intended for the traffic currently on the STN to be migrated to SummitNet II in the very near future. Figure 6 depicts the network topology of SummitNet II.

Montana Videoconferencing Strategic Plan

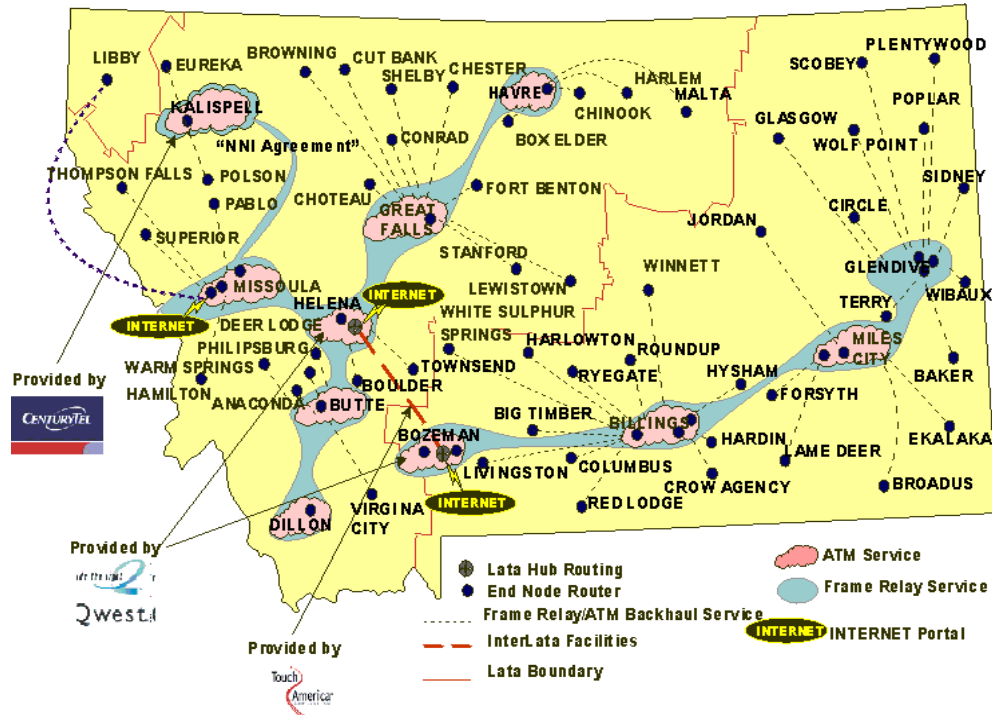


Figure 6 Map of SummitNet II Network Topology

The impending move of voice traffic from STN to SummitNet II means that the videoconferencing traffic also will be riding on SummitNet II. To handle immediate videoconferencing requirements and preserve the existing METNET service, the videoconferencing systems will remain behind the PBX as shown in Figure 7.

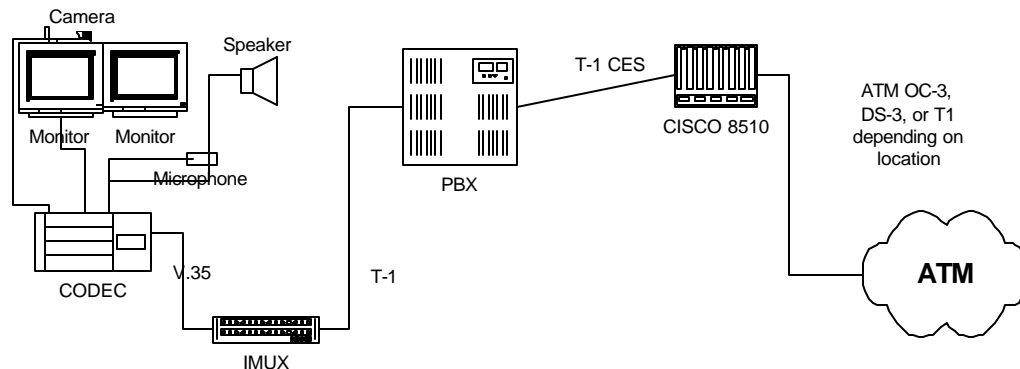


Figure 7 Current Plan for Video with the Transition from STN to SummitNet II

This configuration was tested during the week of May 13, 2002. Test results were somewhat problematic and inconclusive. While calls experience unexpected hang-ups during the test period, there was no indication of problem between the PBX and ATM network. At present, re-tests are being run to determine if problems exist between the videoconferencing system and the PBX. Test calls are being made for calls running over the ATM and over the

Montana Videoconferencing Strategic Plan

STN. Further testing revealed that calls still experience unexpected hang-ups during calls made both over the ATM network and over the State Telecommunications Network. If ITSD decides to proceed with the ATM cutover, there should be a focused effort to achieve successful testing of operating the current H.320 videoconferencing service over the ATM network because of the capacity of the PBX and the inefficiencies of running videoconferences through the voice network riding on ATM, it is intended that the videoconferencing systems will move out from behind the PBX. However, at present, no technical plan has been adopted. Additionally, if problems that appeared in testing are related to the connectivity of the videoconferencing systems through the PBX and are compounded with running that traffic over the ATM then increased attention should be given to providing a solution to move the systems off of the PBX.

While the long-term plan is to replace the H.320 equipment with H.323 equipment, this may be a lengthy process due to the unknown availability of funding. Since moving videoconferencing traffic off of the PBX systems is a critical success factor to ITSD, there are several approaches that can be considered to achieve this and to still enable the SummitNet II cutovers to be performed. **FE** has identified three options, which are summarized in the discussion that follows.

- **Option 1 - Multiprotocol Router Encapsulation:** the first option consists of encapsulating the H.320 data within an ATM PVC via a serial data interface. This implementation requires the use of an interface device that has a V.35 or comparable serial interface to serve the CODEC while connecting to an ATM switch either on the state location or at a central office. An example of this approach to endpoint connectivity is shown in Figure 8.

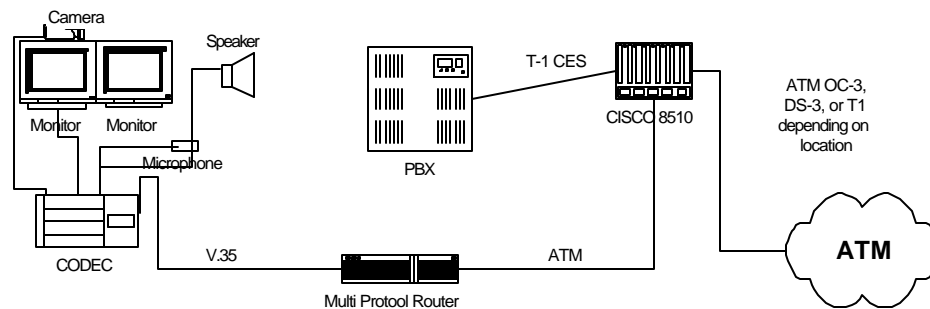


Figure 8 Diagram of Option 1 - Encapsulation

These interface devices, called multi-protocol routers, use the dial string to map the data onto a PVC within the ATM network. The dial string is a phone number defined for a system or a bridge and the PVC takes this data through the ATM cloud to the endpoint defined by the PVC. For example, a user may dial or select a directory entry that dials a number such as 406 555 1111 and the multi-protocol router opens a PVC from the local ATM switch to a distant ATM switch. The multi-protocol router cross references the dial string to a table of PVCs and opens the corresponding channel. Drawbacks include maintaining routing tables that map dial strings to PVCs for every point-to-point connection

Montana Videoconferencing Strategic Plan

desired. Alternatively, the endpoint could always call the MCU. However, this home run approach tends to utilize more network resources than necessary.

- **Option 2 - Multiprotocol Router Circuit Emulation:** a second option uses a multi-protocol router with T-1 circuit emulation instead of a serial data interface. The implementation and challenges here are the same as in the first option.

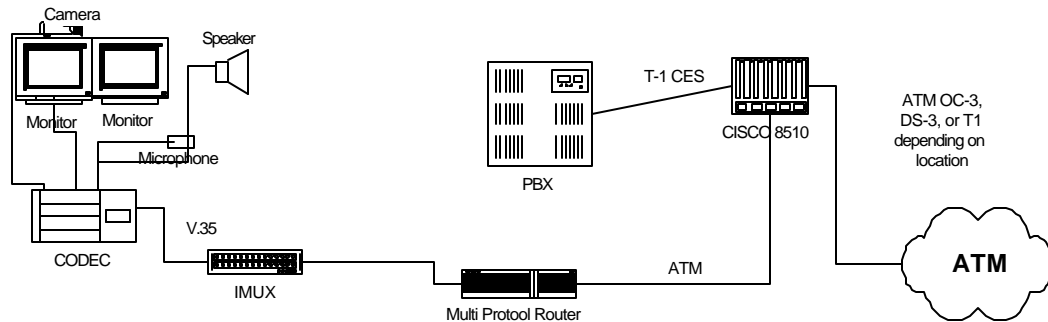


Figure 9 Diagram of Option 2 – Circuit Emulation

- **Option 3 - Dual Capability Video Equipment:** this third option requires a swap out of H.320 conference equipment with systems that have H.323 capability and running this over IP onto the ATM. This could work either through the existing LAN environment or with a separate, dedicated LAN (or VLAN depending on the local technology). This option requires a significantly higher investment of time and resources to plan and manage, as well as requiring the investment in new equipment at a time when funding may be difficult to obtain. The biggest challenge with this solution is handling the network issues. A videoconference of 384 kbps requires about 768 kbps of bandwidth. In a dedicated LAN environment this should not be a concern; however, for a shared LAN connection through the ATM, utilization of LAN bandwidth for voice and data traffic is likely to interfere with the bandwidth required by the videoconference call. While Quality of Service (QoS) can be managed within the ATM environment, the only QoS solution in the LAN environment is to use additional bandwidth. The current version of IP used at the LAN (IPv4) does not provide QoS capabilities to manage on a service-specific basis. Additionally, firewalls and Network Address Translation (NAT) provide additional management and configuration challenges. Since generally it is believed that videoconferencing equipment is less susceptible to security threats, they are often placed outside the firewall to avoid the configuration and management issues involved with using proxies and opening up ports on the firewall. Figure 9 shows an example of a H.323 implementation. A more detailed treatise on IP videoconferencing networks, based on work by Wainhouse Research, is included in Appendix D.1.

Montana Videoconferencing Strategic Plan

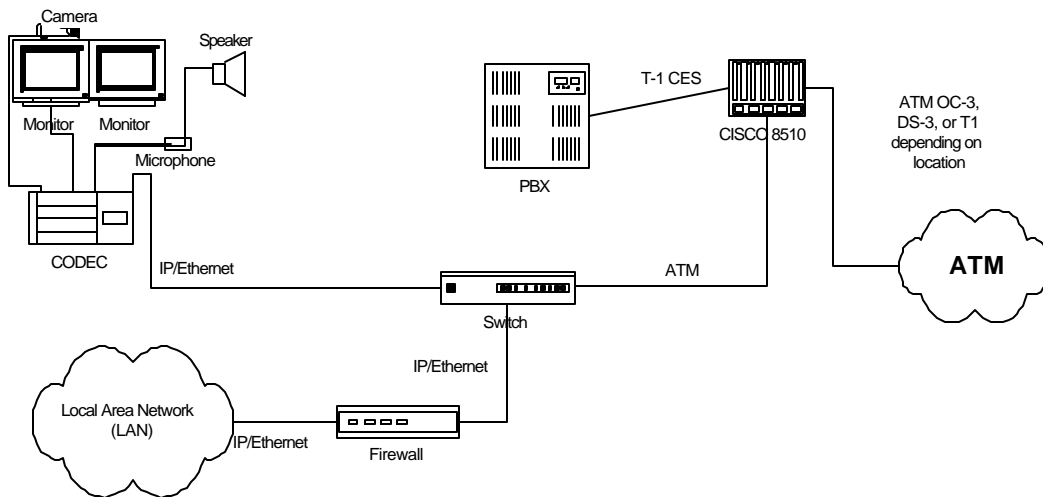


Figure 10 Diagram of Option 3 – Dual capability equipment

FE has observed the industry moving toward the eventual replacement of H.320 equipment but in many cases due to the huge equipment costs they are utilizing one of the first two options as an interim step. In this way, organizations gain two distinct advantages. First, they can extend the life of old equipment by migrating existing H.320 equipment and thereby delaying the purchase of new H.323 equipment. Secondly, they gain time to plan for the increased complexity and bandwidth required by H.323 video over the wide area network.

If it is determined to be necessary, **FE** recommends that the State of Montana move video traffic off of the PBX via **Option 1 - Multiprotocol Router Encapsulation**. This implementation provides the simplest solution to implement quickly and efficiently. Products to accomplish this include vendors like First Virtual Corporation (FVC) with years of support and firm commitment to product support and development. Other manufacturers surveyed offered product with technically similar approaches but less commitment to the product. This solution eliminates the need for the IMUX and thereby eliminates a possible point of failure. The solution also takes advantage of putting video traffic directly onto the ATM network without converting it to IP and adding unnecessary overhead.

The simplicity of Option 1 eliminates the inverse multiplexer and thereby streamlines operation. While it is always advantageous to eliminate equipment where possible, vendor commitment and cost considerations provide the impetus to keep the second option as a viable alternative.

Anticipated Growth

The combined demand for videoconferencing services expressed by the Department of Transportation and by the Courts will drive growth in videoconferencing endpoints by more

Montana Videoconferencing Strategic Plan

than twice the number currently supported by METNET. The lack of PBX presence and cost of scaling SummitNet II service to achieve bandwidth required by videoconferencing units complicate growth alternatives. Without PBX presence, each site must define a method of connecting with other sites. If the site has ATM service, one of the options discussed in the previous section can be employed. If the site does not have ATM service, the network must be scaled to include that site with ATM or provision must be made to account for the network-to-network interfacing. Also, if the site is not served with bandwidth sufficient for supporting video, the network must be scaled to meet demand. This can be exceptionally costly in areas where service will need to be backhauled through multiple carriers. The Department of Transportation would like to have at least one videoconferencing system in each of the five District offices and the six Division offices. The Courts would like to have an endpoint in every one of the 56 County Seats. At present, data connectivity is provided to all of these sites. **FE** evaluated utilization of the data connections to each of the MDT sites and concludes that half of the sites would be able to sustain video at 384 kbps while the other sites would need to increase bandwidth. Most of the 56 county seats are connected with frame relay circuits of bandwidth insufficient for supporting video traffic.

There are several viable options for providing the network capabilities required to support the delivery of videoconferencing services, outlined as follows:

- Scale up SummitNet II,
- Lease public switched access at each location provided by the local carrier,
- Lease switched private network services similar to what is done today on the STN, and/or
- Obtain videoconferencing services by a private provider.

It is possible that several of these alternatives may be utilized, particularly in terms of the state's desire to 'connect networks' and utilize, where possible, existing videoconferencing capabilities.

Supplier Environment

Network

The State of Montana awarded Qwest the contract to provide SummitNet II ATM and Frame Relay (FR) service to state agencies. At present, most locations with METNET videoconferencing sites have ATM service available. Technologically, the connection of these sites to the ATM cloud will use at least a T-1. The other sites served by SummitNet II use 56Kbps service through Frame Relay. However, the impending demand for additional videoconferencing services for the Courts and MDT present a challenge for the coverage area of Qwest ATM and FR with sufficient bandwidth to support video. There are several issues beyond the general availability of ATM that are of concern:

- **Network design validation, testing, and management:** Qwest indicated that although the conversion plan for video in conjunction with the SummitNet II ATM network implementation was included in their initial proposal, there have

Montana Videoconferencing Strategic Plan

been sufficient changes in the overall architecture and plan that the conversion plan needed to be redeveloped. Specifically the video-testing plan needs to be redone to reflect the architecture that will be in place at the conversion, since the state would most likely still be using H.320 equipment as the ATM network is implemented. Qwest indicated that they would provide basic SNMP monitoring for the ATM network but did not know for sure what reports or QoS indicators would be available to the state. Qwest offered to look into the potential of a toolset that the state could access to provide reports, based on a Concord product. It has not yet been determined what organization (Qwest or the state) will manage the Cisco 8510-type devices that are planned as part of the recommended architecture. These issues need to be addressed before the conversion plan is finalized and before any actual cutovers take place.

- **ATM features and pricing:** Qwest was not able to confirm a date that switched virtual circuit (SVC) features would be available in Montana. They also indicated that while they understood the state's request for "postalized" pricing on T-1 access circuits, that mileage-sensitive charges would continue to apply for these services. Qwest indicated that a technical support person would be assigned to the state account going forward and would provide Systems Engineering support.

Overall **FE** sees several issues based on interviews and from several meetings with Qwest:

- The lack of coverage of the Qwest ATM network across the state, particularly for the emerging sites for MDT and Courts will force additional complexity in the planning and operation of the video network due to the need to interoperate ATM with Frame Relay and possibly private line circuits at various bandwidths
- The unavailability of postalized T-1 rates, which is offered by Qwest in Colorado, will cause additional costs for access from many locations.
- The unavailability of SVC's from Qwest will cause the engineering of the network to home all PVC's on a MCU bridge, causing additional network utilization and potential points of failure (networking and equipment) due to the longer paths to connect the calls.
- The sales and technical support structures that Qwest is providing have had a great deal of turnover. Without adequate planning and investment of time and resources, this may lead to a reduction in the knowledge of the state's requirements and historical problem solving which would be helpful in planning for the SummitNet II transition.

Videoconferencing Equipment

The state currently has an agreement with NextiraOne for maintenance of equipment at all locations including CODECs and the MCU located in Helena. The annual cost for this support is approximately \$79,000, which includes all parts and labor. A 2-hour on-site service response is expected by the state. Because the state also has a contract with

Montana Videoconferencing Strategic Plan

NextiraOne for PBX service in all METNET locations, this service level has been achieved by utilizing the same personnel.

NextiraOne has an operations center in Houston responsible for coordination of services, but most videoconferencing equipment services calls are placed by the site contact to the local NextiraOne technician. Centralized trouble tracking is not done by NextiraOne in the present arrangement, so an accurate, statewide determination of the frequency or severity of problems is not possible at this time.

With the increasing age of the equipment there is concern about the increasing cost of maintenance. NextiraOne estimates that the maintenance cost is about 15% of the original equipment purchase price. There is concern about the manufacturer's support of the present CODECs because of their age and stability of the manufacturer's business repair services. When the newer technologies are implemented, the overall cost of maintenance should decrease, even with the cost of labor increasing. Improved remote diagnostics that become available with new equipment might further decrease the service costs.

Interoperating Networks

Montana's government, educational, and private entities have access to several videoconferencing services across a range of private and public, non-profit and for-profit providers. As mentioned previously, METNET services have been provided to state government and higher education entities for about 10 years. During this period, other videoconference providers have emerged to meet specific needs within the communities of Montana. Within the medical community of Montana, four telemedicine networks have emerged to meet the needs of clinical health organizations. In the private sector, VisionNet has built an extensive network of sites within the K-12 schools, community colleges, universities, and private institutions. Since the availability of providers with a more global footprint (such as Masergy, Intellinet - based on the SAVVIS network, Wire One, and Virtela) is still somewhat limited in Montana, to use these providers now would require interstate T-1s to access their networks. As demand within the state increases, particularly if the state is able to identify the magnitude of demand through a statewide aggregation process, it is anticipated that these providers will consider expanding their network access points into the state. At that point, the cost of access may decrease to the point of having these networks be viable alternatives to in-state providers and to utilizing the SummitNet II network. At that future point in time, especially where providers such as Virtela offer turnkey packages including equipment, scheduling, support, and network services, moving **all** of the state videoconferencing to an outsourced relationship might be appropriate.

Each of the Montana-based videoconference providers surveyed is available for use by state agencies. However, because of the various approaches to determining what user has priority for use at a given facility, frequent use of these non-METNET videoconferencing services can be difficult for the low/light user.

This study presents a review of the leading videoconferencing service providers available to Montana state government agencies. Each service is examined in the areas of geographic coverage, shared use policy, technical capability, interoperability, and operations. The table

Montana Videoconferencing Strategic Plan

shown in Appendix B.1 provides coverage listing of all communities covered by current video networks today, and Appendix J.1 and J.2 present maps indicating geographic coverage of these networks. Additional information has been provided on location of the state-run SummitNet II connections as well as locations for Department of Transportation and county seats representing the predicted growth areas.

Although the analysis covered a wide spectrum of service providers, some networks warrant a more detailed review because of their current and/or anticipated role in collaboration with the state-driven videoconferencing needs.

VisionNet

VisionNet provides videoconferencing and network services to private and public users. With implementation of videoconferencing studios in the K-12 schools, the priority for room scheduling needs to be cleared through the local school before confirmation is given to users. Technically, VisionNet employs H.320 videoconferencing standards with core product from VTEL and Polycom. And although they are experimenting with H.323 videoconferencing, 95% of their operation is based on a H.320 standard with bridging capabilities provided through eight NEC bridges at four locations and one Accord MCU bridge.

Although VisionNet connects regularly to METNET and other networks, differences in the technical configuration and operations have lead to interoperability issues. Technically, the VisionNet conferences operate at a rate of 1288 kbps and nearly always have to ensure transcoding is used for conferences with endpoints off the VisionNet network. Additionally, a proprietary control system is implemented for remote control and does not interoperate well with systems outside the VisionNet network.

During a meeting held with VisionNet at their Helena location, VisionNet gave an overview of how VisionNet is providing ITV services today, including a discussion on services to the K-12 communities and the private sector. They feel that the school and tribal programs have been very successful although there have been difficulties due to the complex nature of the interfaces, particularly in the service provider area (outside of their parent companies' service areas – the Montana Independent Telecommunications Systems – MITS, which consists of five regional telecommunications service providers: Central Montana Communications, Inc., Nemont Telephone Cooperative, Inc., Project Telephone Company, Inc., Triangle Telephone Cooperative Association, Inc., and Valley Telecommunications, Inc.). The financial arrangements with the K-12 schools were covered, explaining how equipment and services are priced, and how Universal Service Fund (USF) grants have been able to be applied in order to reduce the actual cost to the schools. Also covered was the commitment that MITS has for providing affordable videoconferencing services to Montana's communities. VisionNet covered their plans to utilize Session Initiation Protocol (SIP) for scheduling and control, and the potential beta test of a soft switch to enable the shifting of management and control further into the network. In achieving that goal, a reduction in the current feature

Montana Videoconferencing Strategic Plan

set may be necessary to enable lower costs and reduce the complexity of the services. VisionNet indicated that the videoconferencing network was not being used anywhere near capacity and that there are not many K-12 sites that used their allocation of approximately 940 hours per year in recent years. VisionNet also indicated that there are about 30 hours per day of commercial use (2 hours of conferencing at 15 sites) and a small amount of telemedicine conferencing. VisionNet indicated that proposed changes to the network would tentatively allow the use of SVC's in the June-July timeframe.

VisionNet discussed several views of partnering with the state going forward, but noted that dealing with the network interconnection issues would be the most difficult issue to address. A consortium model that is being used in Ohio was referenced that VisionNet feels has been moderately successful. It was also mentioned that VisionNet suspects that a full outsourcing of all lifecycle functions would be difficult in Montana where there are so many network providers.

VisionNet also described the architecture and pricing of videoconferencing services being provided to the Courts. They indicated that providing a single point of contact for scheduling and the management of services, and meeting the client's need in as close to one call as possible, were important factors for a successful managed services arrangement. VisionNet indicated that they would also consider offering equipment and maintenance services, although it was noted that the equipment for the Courts' recently acquired sites was done through another supplier.

Overall, it appears that VisionNet is committed to providing high quality services to their clients, and is very interested in strengthening and deepening the partnership and interoperability with METNET. They appeared to be very open and cooperative and view the state as a valued partner for the Internet services as well as the videoconferencing services, as an interconnection or on a managed services basis. While a more thorough diligence should be done on their financial condition and their technical plans (particularly to explore the plans for their proprietary control system), they appeared from a senior leadership standpoint to be very committed to a successful partnership with the state.

Eastern Montana Telemedicine Network

Eastern Montana Telemedicine Network (EMTN) is similar to METNET in size and operation being comprised of 21 sites and centrally operated with a multi-use approach. However, the primary focus and responsibility is to provide medical services. EMTN is open to non-profit use based on a priority hierarchy with Medical Services at the top and then serving Continuing Education, Administration, and Community Development needs. At present EMTN runs H.320 standards based videoconferencing over dedicated T-1 telecommunication links serving video with 384 kbps and a combination of voice and video over the remaining portion.

Montana Videoconferencing Strategic Plan

EMTN indicated they have a three-year transition plan to migrate to videoconferencing systems with H.323 capability moving from their existing VTEL equipment to dual standard Polycom equipment. However, EMTN also views H.323 video as expensive with a large bandwidth requirement for the overhead associated with IP based videoconferencing. Therefore, EMTN intends to first use H.323 in an intra-hospital implementation and has no clear plan to move to H.323 video over the wide area.

EMTN regularly connects with other networks and maintains dedicated T-1 connections with other two other telemedicine networks, VisionNet, and METNET. Operationally, they use central scheduling involving both software and personnel. Support during a conference is available without additional charges from an operator at the content originating site only.

Overall, EMTN appears to be a valuable partner and recognizes that although the primary business focus of EMTN and METNET are different, both providers have similar goals and approach for the needs that they serve. For this reason, **FE** feels that ITSD should maintain and improve relationships and interoperability between the two networks. Continued momentum should be kept with the attention to the technical detail of interconnection such as the need for transcoding and operational assistance during the videoconference. Improvement will center on defining more ways that the two entities can be engaged in areas such as user group forums, a buyer's consortium or statewide partnering task force.

National Guard

While still in its infancy stage, the Montana Army National Guard is in the process of deploying videoconferencing services throughout the State of Montana through a federally funded initiative. The National Guard has chosen TANDBERG as the core equipment with both H.320 and H.323 standards. At present, they connect to a national ATM network provided by the National Guard through an initiative called Guard Net 21. Additionally, within the State of Montana, they have used the SummitNet contract to purchase ATM over T-1 to 22 locations intended to provide both video and data capabilities. To promote utilization within the State of Montana, the Guard intends to purchase a MCU bridge for the specific purposes of intra-state conferencing.

Conceptually, there is a strong desire to promote shared use within Montana with the priority given to official Guard business. At the present time, operational support of the network rests with the Guard, through a nationwide managed services contract with a third party provider. The Guard indicated a desire to transition the network support functions to the State if practical. As most of the videoconferencing endpoints are located within armories, there are policy issues regarding physical access and shared use that would need to be addressed, as well as to determine how the costs for this support should be accounted for. Additional challenges may exist for providing access at all locations in accordance with the Americans with Disabilities Act.

Montana Videoconferencing Strategic Plan

The National Guard appears to be an important partner in the delivery of videoconferencing services throughout the state. With the existing state of deployment and questions regarding actual shared use policy, much of the partnering relationship will need to be worked out over time as more information becomes available. Moreover, ITSD should focus on defining ways that both entities can be involved in areas such as user group forums, a buyer's consortium or statewide partnering task force.

Other Providers of Note

Other video networks play an important part in the complete picture of videoconferencing across Montana. Besides EMTN, three other telemedicine networks exist to support the medical communities:

- REACH Montana Telemedicine Network covers much of the north-central part of Montana with an installed base of 11 systems.
- Montana Partners in Telemedicine Network covers the south-central part of the state with an installed base of 14 systems in Montana.
- VideoLink of St. Peter's covers population centers in the central part of the state with an install base of three systems.

All the telemedicine networks inter-operate with one another using the H.320 standard through leased lines and bridges owned by the network itself.

Tribal colleges of Montana operate in an autonomous manor with an eclectic collection of equipment and network connectivity. The videoconferencing content tends to be limited to material relevant for communication between locations with little to no need to interconnect to other locations in Montana. However, the equipment is standards based and has access to public networks allowing connectivity to locations in Montana or the world.

Mid-Rivers, which provides telephone service to 30,000 square miles in a 21-county area of eastern Montana, has established interactive television (ITV) systems connecting 24 high schools for distance learning opportunities. It was reported to **FE** that these videoconferencing services are provided over DS-3 communications lines, using protocols that do not conform to any of the ITU "H" series standards. At the current time, the Mid-Rivers network does not inter-operate with most other videoconferencing services throughout the state. ITSD has attempted to connect, with limited success, to one of these sites. This connection requires conversion from a DS-3 CODEC to baseband audio and video and re-encoding by a H.320 CODEC, which is costly in terms of equipment use and time and does not work well with more than one DS-3 system. Based on anecdotal comments generated during several of the stakeholder interviews, it is believed that Mid-Rivers is in the process of redesigning their network and moving to H.320/H.323 standards.

Montana Videoconferencing Strategic Plan

Provider Partnering

Partnering among networks provides significant gain in avoiding unnecessary duplication of effort and utilizing the powerful synergies of videoconferencing service providers. The needs of future state videoconferencing users and the current METNET customer base should be considered in light of the benefits and limitations that exist and could persist with collaboration between videoconferencing networks. Where it is practical, interconnection and collaboration between networks will build a stronger service for all videoconferencing users.

At present, for example, METNET has a dedicated T-1 connection with EMTN to enable interoperability of locations on both networks. The T-1 link utilizes a port on the bridges for both METNET and EMTN as well as leased line charges of approximately \$200 per month. Cost for utilization of connecting through public switched access far exceeds the cost of the leased line. Beyond geographic reach and cost benefit of the shared link, collaboration between these two networks has produced soft benefits like shared knowledge based on experiential learning.

Successful partnering between videoconference service providers will take into account the technical configuration details surrounding interconnecting networks and equipment. Responsibility and attention to detail is very important. Both videoconferencing service providers should be accountable to communicate and attend to details well in advance of a scheduled meeting. For example, if one network normally operates at 336 kbps and another at 384 kbps then the signals will need to be either forced to work at one rate or transcoded at a common meeting point such as a conference bridge. Networks that run at 336 kbps usually cannot run at 384 kbps because of the type of network signaling used. Therefore, in the case described above, the equipment typically running at 384 kbps could be forced to run at 336 kbps. Since the number of endpoints running at different rates will compound this problem, it is preferable to use transcoding on the conference bridge. However, as transcoding is a feature that is set up on a call-by-call basis careful attention is needed to make sure it is turned on when calls are made between networks that run at different bit rates.

When connecting multiple sites from one network to multiple sites on another network, it is likely that providers will be using more than one conference bridge. Conference bridges, also called Multi-point Control Units (MCUs), have specific standards for operation and hierarchical management of conferences. Some bridge manufactures have more features than others. Some bridges implement more standards and features based on purchase options. It is critical when interconnecting different bridges to make sure that the call configuration in one bridge matches that in the other. This is the responsibility all providers using a bridges to coordinate with other providers.

Another success factor to partnering is addressing the difference in operations among the providers. This is difficult because each videoconference service provider has its own, somewhat unique, operational processes. During a conference, most videoconference providers have one or more persons responsible for muting microphones, panning cameras, running VCRs, operating document cameras, and handling operational or minor technical difficulties. Each provider has a different title for this person but his or her functional roles

Montana Videoconferencing Strategic Plan

are similar. In a multi-point conference and even in some point-to-point applications one site emerges as the site that originates most of the content. This content originating site usually has more operational responsibility to move cameras and switch video sources that can be distracting to the presenter.

METNET currently provides a high quality of service with a technician at every site regardless of meeting type. Typically, EMTN will only have an operator at the content originating site unless arrangements are made to purchase operator support at content receive sites. VisionNet was designed with educational needs in mind and provides an operator at the content originating site only. Through their proprietary control system, this operator also has control over other sites. Unfortunately, when interconnecting VisionNet sites as receive sites to multi-point conferences originated on other networks, there is not normally an operator present for the VisionNet sites.

Currently, there is a perception of the need for consistency of service and a feeling that automated system operation may be an obstacle to a productive meeting. A partnership requires videoconference providers to work out responsibility and accountability to the customer's satisfaction that includes shared communication and feedback mechanisms with the customer and providers. As technology improves, and as users become more comfortable with the operational aspects of the new technologies (especially with H.323), **FE** believes that many client organizations will opt to eliminate the onsite operator with this approach. This decision will become one of affordability rather than for service guarantee. There is no one correct technical or operational model but successful partnering will provide a consistent level of service that meets user needs.

Table 1 below summarizes the videoconferencing providers examined in this report for the strengths of interoperability.

Videoconference Service Provider	Direct Interconnectivity with Other Networks	Bandwidth Used Most Frequently	Own Bridge Equipment	On Site Operation
METNET	EMTN	336	Yes; Video Server	Technician at every site
Vision Net	EMTN	1288	Yes; NEC and Accord	All sites controlled from instructor site. Local control available to user with password protection.
EMTN	METNET REACH MPTN VisionNet	384	Yes; Smartlink	Operator available at content originating site but not at a receive site.

Montana Videoconferencing Strategic Plan

Videoconference Service Provider	Direct Interconnectivity with Other Networks	Bandwidth Used Most Frequently	Own Bridge Equipment	On Site Operation
Army National Guard	Nation-wide National Guard network called Guard Net 21	768	Planned; Accord	Operator available at content originating site but not at a receive site.
REACH	EMTN	336	Yes; Lucent	Unknown
MPHT	EMTN	384	Yes; Accord	Unknown
VideoLink of St. Peter's	None	336,672	No	Unknown
Tribal Colleges	None	2x56, 336, 384	No	Unknown
Mid Rivers	Not Avail	T3	Not Avail	Not Avail

TABLE 1 – Videoconferencing provider comparisons

Process Analysis

The following areas provide an overview of the current processes that are being used within the METNET environment.

Operational Processes

The technical support staff provides a wide range of services for the MTENET videoconferencing customer base. This currently includes scheduling, technical support, technology procurement and installation, conference monitoring, planning, billing, invoice adjustments, and general care and feeding of the interfacing/interoperating organizations such as EMTN, the universities, and the other service providers. This is done with approximately 2.5 FTE's, located in Helena. The group has a stellar reputation with all stakeholders who were interviewed as part of this project. Many of them said that the only reason that METNET is successful is due to the dedication and commitment of Rick Wine and his staff. The staff members have a high degree of concern for the quality of the services provided, and are often involved in proactive monitoring of calls to insure that the users are satisfied. This is an investment that ITSD should review occasionally to insure that it is providing the appropriate value.

There are very few metrics that are tracked formally and regularly. There is little mechanization available to assist in the analysis of faults or process errors. To be even more effective, ITSD should investigate measurement tools and capabilities that would help the team understand the performance of the technologies (network and equipment), the processes (scheduling, billing, etc.), and the suppliers (network, equipment, and maintenance). This is a critical area and should be emphasized as the roles of the team are redefined going forward.

Montana Videoconferencing Strategic Plan

Limited training has been provided to the staff to keep them up to date on hardware, network, and software technologies. This is partially a self-selected approach by the team, in that there was no plan to implement new technologies until recently. The team uses industry periodicals and other reading materials to keep their knowledge somewhat current, but an investment in the key people attending training and/or industry conferences would most likely have significant payoff in improved skills as well as employee morale.

Costs and Chargeback Processes

The current approach for charging METNET customers is based upon the need for ITSD to recover all of its fixed and variable costs (direct and allocated) assigned to the videoconferencing cost pools. A brief analysis of this approach indicated that virtually all costs are fixed except for the potential impact on the technical support staff of significant changes in volume. Also, other than the T-1 access costs for two sites that are not on the State Telecommunications Network, there are no network costs currently assigned to the videoconferencing product cost pool. ITSD indicated that the practice of assigning a share of the general network costs was discontinued several years ago. The T-1 access costs for the two off-network locations are shared across all users as part of the basic METNET service rate.

The annual chargeback rate for videoconferencing services is defined by projecting the overall costs and dividing it by the projected demand, to yield a budgetary cost per hour. In recent years, the demand projection has not been highly accurate, which has resulted in a cost recovery process that does not cover the budgetary amounts. For example, the current FY03 budget is based on a forecast of 2,494 conference hours, calculated with concurrent use by 5 sites, for a total of 12,470 billable conference hours. The utilization in FY 2001 was approximately 9,330 hours. It appears that several factors are changing:

- The average number of sites per call has dropped from 5 to 4.
- The overall utilization is down significantly, yet the current FY03 cost model includes a level of participation at which the current billing rate will significantly under-recover the expected costs.

The overall recent trends are shown as follows in Figure 11.

Montana Videoconferencing Strategic Plan

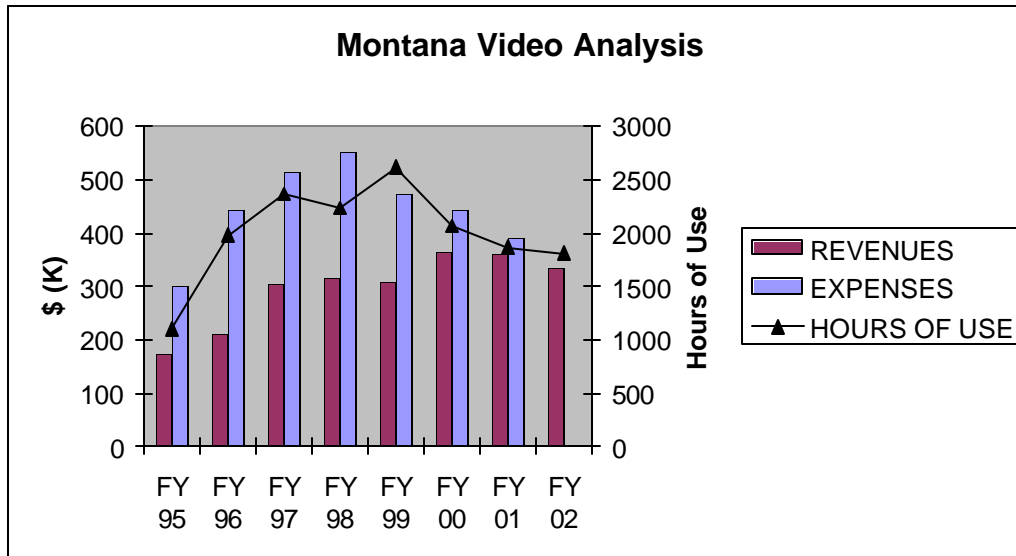


Figure 11 - Montana Video Analysis, Source: ITSD (Note: Hours of Use are adjusted based on number of conferences, not total hours of conferencing use)

The key issue here is that the forecasts being used for revenue/expense analysis do not appear to be in synch with the recent actual results. **FE** understands the difficulty in working within the biennial budget cycle schedule and that these forecasts were made in 2000. Shifting to a subscription-based approach helps mitigate the difficulty of preparing accurate forecasts of demand several years out.

Historically, ITSD has been involved with the entire process of delivering videoconferencing services. In addition to the oversight responsibility, ITSD demonstrates strength and interest in planning, design, implementation, and operation. **FE's** research has indicated that there are few models of successful and cost effective managed videoconferencing services for state governments, due to the complexity of the support systems and the number of different supplier organizations involved in providing a complete solution. Even greater degrees of complexity are introduced with the convergence of voice and data networks because videoconferencing technologies are comprised of characteristics of both types of networks. In addition to videoconference and network suppliers, the coordination of activities provides major logistical challenges such as scheduling rooms and equipment and other endpoints, and facilitating multi-point calls, providing operational support, and quick response to technical difficulties. Even with the best systems today, the development of software tools to assist in all these areas lags behind the need.

On a conference call with senior ITSD leadership, **FE** discussed ITSD's disposition to using managed services for processes within the videoconferencing lifecycle including:

- Planning (technology, locations, processes, policies)
- Design/procurement/installation of equipment and locations
- Design/provisioning of networking
- Scheduling and management of videoconference calls
- Operation of videoconference calls

Montana Videoconferencing Strategic Plan

- Technical support during videoconference calls (including monitoring)
- Back office service such as billing, adjustments/credits, etc.
- Client relationship and client satisfaction
- Oversight and responsibility

ITSD places a strong emphasis on oversight and responsibility and considers that the areas of planning, billing, and client relationship management absolutely require direct ITSD involvement. While ITSD was open to managed service models in other areas, they expressed caution and a need to work closely with any provider in the areas of network design/provisioning and the interface of back office services directly with their clients.

According to a survey done by Wainhouse Research, Inc. approximately 90% of the videoconferencing services are provided and managed by the client organization – only around 10% are using “outsourcing” or “managed services” arrangements. Most of those arrangements are in states where the incumbent local exchange carrier (ILEC) has a broad footprint and can offer network connectivity at a “postalized”, or distance-insensitive, rate. In looking at the factors that drive the outsourcing of videoconferencing services, **FE** believes that the key elements are network costs and differentiation:

- The costs of equipment are relatively low compared to the ongoing operating costs. While full-function videoconferencing rooms may cost \$60-75K, portable units are in the \$25-30K range. With a lifecycle of 5 years, it is likely that the usage costs would be substantially greater than the equipment costs. Aggressive equipment discounts are available to state governments that make it unlikely that equipment cost will be a major selling point for the outsourcer. However, network costs, particularly dedicated access to a limited number of ATM backbones, can be very costly in states such as Montana. If a service provider is able to offer low cost access, or is willing (as in North Dakota and other states) to offer postalized (non-distance sensitive) pricing for that access, the network cost differential across suppliers becomes much more important.
- Differentiation of services by a provider can occur through improved scheduling, technical support, implementation planning, billing, or an integrated suite of these services. Larger providers that may have invested in web-based, easy-to-use scheduling systems will offer advantages to smaller entities such as state governments that don't often have the resources or funding for those efforts. If the features offered by that differentiation provide the right value proposition to a client (private or public sector) then the outsourcing alternative becomes much more attractive.

Comparisons/Best Current Practices

FE studied how four states deliver videoconferencing to establish a baseline for comparison and best practices. **FE** feels that the large rural states of North Dakota, South Dakota and Wyoming provide a solid comparison based on state location and demographics. Indiana was also selected for this baseline comparison because of their experience and stage of progression in providing videoconferencing services. Detailed comparisons can be seen in the tables located in Appendix C.1 through Appendix C.4.

North Dakota

The North Dakota Interactive Video Network (IVN) consists of 60 classrooms in 37 communities across the state. Classrooms are located in University campuses, the State Capitol, and 23 K-12 schools. The network is expanding and transitioning from an H.320 based network to a H.323 based network.

North Dakota has passed legislation (SB 2043) to provide “access to wide area network services and each county, city and school district that desires access to transmit voice, data or video outside that county, city or school district shall obtain those services from the Information Technology Department”. This law is now in effect and a contract has been awarded to develop a statewide ATM network, including postalized rates for T-1 service anywhere in the state.

The impact of this law will allow all data and video to reside on the network. A decision was made to centralize certification and registration of equipment. Centralized scheduling of the MCU's and gateway is allowed on a web-based software. Qwest has been awarded a state contract for equipment, setup and support for local purchase of equipment.

The department is funded through a process of defining and assessing a fair and equitable billing structure for services that provides for payback of the initial investments and ongoing operations. This is accomplished by determining the actual cost of providing a specific service and establishing a unit rate for that service. Videoconference bridge services are billed at \$ 65.00 per hour of use. All LAN access rates are priced per month.

South Dakota

The Digital Dakota Network (DDN) is a state-supported digital communications system that delivers high-speed data connectivity to all public schools in South Dakota.

Through cooperation of US West and over 30 independent telephone companies serving 176 school districts, five universities, four technical schools and several dozen private schools the state achieved a flat rate, distance insensitive contract pricing for ATM and frame relay services. Video conferencing is available to all high/middle schools. The system

Montana Videoconferencing Strategic Plan

has 265 sites directly connected to the ATM network. Protocol is H.320 at a rate of 768 kbps for education or 384kbps for commercial and government use

The video teleconference charge for all uses at this time is \$30 per hour per location intrastate. Scheduling is done on a web-based software package. The state funded purchase and placement of LAN equipment and distance learning equipment in all high schools. All Universities and state agencies fund and support their own equipment.

The state is in process of testing H.323 protocol but at this point is not pleased with the quality of transmission.

Indiana

Indiana has developed the Indiana Higher Education Telecommunications System (IHETS) to provide a statewide network for voice, data, and video communications. IHETS maintains the Indiana Telecommunications Network (ITN), a statewide telephone network for higher education and state agencies, and other allied services. They support over 60 campuses and community based locations.

Because of the need for technology refreshment, the IHETS appropriation request for network enhancements for 2001-2003 is an additional \$1,920,000 over their recurring budget of \$3,281,900. This will be used for improving network reliability and non-video teleconferencing related needs.

IHETS did an original study of H.323 transmission in 1999, which has evolved into an Internet Protocol Video Task Force to develop an implementation strategy. The task force has developed standards for terminal equipment, multipoint conference units (MCU), gateways and gatekeepers, and will continue to deal with quality of service (QoS) issues.

In the H.323 model, a fixed price of \$1,675.00 per month is charged for T-1 ATM and video services to each location. The state has a contract with AT&T for postalized T-1 lines to anywhere in the state.

The implementation of video teleconferencing in the state has changed from the original design, and the network is now compressed to a single bridge and switching location in Indianapolis.

Wyoming

The State of Wyoming has two video networks in place at this time. The Wyoming Video Conference System (WCVS) and Wyoming Equality Network (WEN). The former is a state centric network of 29 locations in 23 communities. The former network consists of primarily T-1 facilities servicing voice, data and video needs for state law enforcement, state

Montana Videoconferencing Strategic Plan

libraries, the University of Wyoming and seven community colleges, Internet access and state government voice traffic. This network utilizes the H.320 protocol.

WEN is primarily an education network supporting all schools in the state in conjunction with the state Information Technology Division. Basic service of T-1 rate is provided to high schools and University users, and 56kbps service is provided to elementary and middle schools. Funding for WEN is by legislative mandate under a court order. This mandate is for network implementation only.

Scheduling on the WEN system is done manually with a coordinator at this point. Most rooms are not dedicated to VTC, so local contact must be made. The WCVS system requires two-week notification under normal circumstances. Both systems are working on integration of networks and scheduling.

Louisiana

Louisiana is the only state that **FE** has identified at this point that has completely outsourced their videoconferencing services. Through an RFP process about five years ago, the state engaged BellSouth as the sole provider of videoconferencing to the state agencies, National Guard, and higher education institutions. The decision to outsource these services was made based on the belief that a single supplier could serve the state's clients better than the state could do internally. BellSouth offers voice, data, and video services across most of the state, and provides the interface to other local carriers where they do not have a presence. It appears that their coverage within Louisiana is much less fragmented than what exists today for any single supplier in the State of Montana.

Louisiana is currently using H.320 equipment, connected by either ISDN or dedicated lines at various speeds. There is a one-time cost of \$750 to establish the network connection, and a variable cost for the local access. This access cost ranges from \$500/month for 384Kbps to \$750/month for T-1. These costs are the same regardless of where the service location is (postalized). Network usage is charged at either \$.33/minute for 384Kbps for occasional users or \$600/month for unlimited use at a location. They also charge \$60/hour for monitored service, which provides real-time monitoring of videoconferencing calls by BellSouth technicians. The equipment is funded by each agency, as are the costs for local onsite support, if they choose to utilize that approach. Cross-agency use of dedicated facilities is charged at rates negotiated individually by the agencies involved.

There are 300 locations on the network, generating approximately 2.5 million minutes (almost 42,000 hours) of conference use. Most of the use is for higher education, although the growth of agency use has been significant recently. They are in the process of adding another 20 rooms to their network at the current time. A centralized bridge is provided by their IT department and is used for all except point-to-point dialup calls. BellSouth provides a web-based scheduling tool that is available to all agency representatives to schedule calls. Conflicts are resolved through the BellSouth customer care group, which also provides technical support, installation testing, and network management services. They are using two primary equipment suppliers, Polycom and V-Tel, and the agencies decide which

Montana Videoconferencing Strategic Plan

equipment they want to purchase from the statewide contract. Historical utilization and online billing reports are also available from the scheduling system. BellSouth has also provided access to their trouble-tracking system for the IT department coordinator to monitor their response to problems.

There is one person assigned from the IT department as the overall coordinator. The majority of this person's time is spent marketing services to the agencies and working with them on how to better use their facilities. This person is also responsible for supplier management, procurement issues, and equipment evaluation. There are no formal Service Level Agreements or metrics in place at the current time although they are working on developing them. The current network availability is over 99%, with only .8% of the faults being caused by network problems. There are no policies in place mandating the use of videoconferencing. There is very little desktop videoconferencing taking place at the current time, although some growth is expected. They are anticipating the need for policies within the IT organization to control the impact of this emerging service on the WAN/LAN utilization.

Louisiana is just starting to evaluate the potential migration to H.323 standards, being driven primarily by the needs of the higher educational segment. The K-12 and library users are able to take advantage of e-rate funding for the equipment and services, and they work directly with BellSouth as the IT department is not a recognized e-rate supplier.

Other States

Other states were given a less detailed review but serve as good examples for various areas of expertise. For example, Ohio's OARNet is a leader in H.323 videoconferencing and training local support personnel. New York provides an interesting operating model by eliminating the equipment responsibility and providing network services only. Missouri's MoreNet serves its customer base with both H.320 and H.323 based videoconferencing. Oklahoma's OneNet supports over 600 H.323 endpoint locations with network and MCU services for a flat monthly rate.

Summary

Among the states reviewed, the most significant commonalities exist in the strategic network direction and in the funding support for each implementation. Specifically, most states are moving toward a H.323 standards based videoconferencing implementation and most state have received significant funding from the Legislature.

Most of the states studied are in transition from a H.320 based video teleconferencing network to a H.323 based network. Quality of service for video on the data network still is a large issue. Network architecture, both in local LANs and the Wide Area Networks (WAN), require adjusting to succeed in an H.323 environment. Firewalls present additional issues to video teleconferencing.

Montana Videoconferencing Strategic Plan

General funds, either through departments or direct, usually are funding this second generation of video teleconferencing. User fees cover only part of the operating costs of these systems.

The most interesting observation is that there really doesn't appear to be a standout "best practice" among the public sector entities. They have taken generally similar approaches to planning and operations. Their approach to chargeback varies but essentially falls into one of two models – usage-based or subscription. They are all planning for technology migration, both for network and equipment. There is only one state (Louisiana) that **FE** identified that had a total "managed services" relationship in place. They have been very happy with the results, and they are currently reevaluating their approach for the next procurement cycle and to address the emerging demand for H.323 connectivity. The managed services provider in that case was the ILEC, BellSouth.

An issue that ITSD must address is how to deal with these external provider relationships in the chargeback process. For the price of "managed services" to be competitive, there must be very little "overhead" (direct or allocated) costs burdened onto what the agencies are paying to these external suppliers. That poses a challenge for ITSD to decide what services would be provided and upon what basis the allocated costs would be assigned to the videoconference product, even if ITSD eventually provides the critical areas that were defined in a planning session with **FE** - planning, standards, client satisfaction, and billing services. As the current allocation is based on a proportion of revenue, the allocation would theoretically go up if added videoconferencing usage increased the internal revenues, even if there was no increase in the fixed costs.

In order to simulate the potential subscription fee needed to cover the ITSD costs, the following approach could be used:

- "Hybrid View"
 - Assume that responsibility for site equipment and site coordinator fees belong to the agencies. This would remove the site equipment depreciation, site equipment maintenance, site coordinator fees, and vendor pass-through fees from the cost model
 - Assume that the T-1 access charges that are required in excess of what is normally planned for the data network requirements are charged directly to the agency responsible for the site.
 - This removes approximately \$340,000 (or 60% of the total budget) from the ITSD cost model.
- "Managed Services" view
 - For a fully deployed network view of costs, assume that the current 22 METNET sites are used, plus 56 Courts sites and 12 MDT sites for a total of 90 sites.
 - Assume that ITSD video staffing and allocations are at 50% of current rate.
 - This removes an additional \$127,000 of expense.

Montana Videoconferencing Strategic Plan

The impact on the potential subscription cost per site per month is as follows:

Approach	Subscription price/site/month
Current	\$538
Hybrid	\$226
Managed Services	\$108

Details of the calculations are shown in Figure 12.

	FY 2003	FY 2003	FY 2003
Cost Category	Current View	Hybrid View	Managed Services View
CSB	\$ 15,346	\$ 15,346	
CTSB-ISD SW/HW	\$ 2,762	\$ 2,762	
ITSB ADMIN	\$ 3,424	\$ 3,424	
NTSB/Voice	\$ 10,699	\$ 10,699	
P&P	\$ 32,244	\$ 32,244	
Total allocated	\$ 64,475	\$ 64,475	\$ 32,238
Pers/Serv	\$ 150,745	\$ 150,745	\$ 75,373
Other Serv	\$ 6,020	\$ 6,020	\$ 3,010
Supplies	\$ 2,318	\$ 2,318	\$ 1,159
Comm	\$ 300,056		
Travel	\$ 2,575	\$ 2,575	\$ 1,288
Rent	\$ 5,214	\$ 5,214	\$ 2,607
Mtcs	\$ 850	\$ 850	\$ 425
Other	\$ 1,246	\$ 1,246	\$ 623
Depr	\$ 41,988	\$ 10,000	\$ -
Eqpt	\$ 578	\$ 578	\$ 289
Cap Adj	\$ (31,614)	\$ -	\$ -
Debt	\$ 31,036	\$ -	\$ -
Interest	\$ 6,017	\$ -	\$ -
Total Direct	\$ 517,029	\$ 179,546	\$ 84,773
Total Expense	\$ 581,504	\$ 244,021	\$ 117,011
Subscription Cost/site/month	\$ 538	\$ 226	\$ 108

Figure 12. Subscription price for recovering ITSD costs, based on FY 2003 planning information provided by ITSD

FE recognizes that this is merely shifting the cost burden from an allocation process to a direct charge process relative to the equipment and incremental network costs, but it does indicate the directional impact of the different approaches.

Montana Videoconferencing Strategic Plan

In a fully outsourced mode where a single supplier is providing all videoconferencing services, **FE** estimates that approximately 1.5 FTE's would be required to provide an acceptable level of support in those areas based on the current client base and utilization of services. This would assume that the service provider was responsible for scheduling (including the use of a mechanized tool), network management, quality assurance, technical support, installation planning and support, procurement of equipment, coordination of maintenance, and design, implementation, and management of bridging capabilities. During the transition period, while working in a dual mode of METNET-provided services as well as "managed services", an additional FTE would be necessary to address the one-time efforts that would be necessary, such as:

- Establishing service level agreements, metrics, and communications requirements
- Developing a conversion strategy and detailed conversion plan
 - Scheduling
 - Technical support
 - Billing and adjustments
 - Equipment provisioning
- Communicating with key stakeholders about the changes
- Designing changes to the agency chargeback processes
- Establishing a formal supplier management process

Further details on the considerations for engaging in a managed services relationship are included in Appendix L.1. It should also be noted that while there may well be suppliers interested in providing videoconferencing for the state under this kind of a relationship, there will be substantially more interest if the state offers a wider range of IT functions to be outsourced, such as the management of the voice and data networks, help desk, and data center operations.

Montana Videoconferencing Strategic Plan

Recommendations

FE's recommendations to the State of Montana's direction for future delivery of videoconferencing services are summarized in the areas of videoconferencing equipment technology, networking, policy, and operational methodology. An overview of the implementation process for the equipment technology and networking areas is included in Appendix M.1.

Videoconferencing Equipment Technology

For a smooth transition to a new technology, **FE** feels strongly that there are a number of important tactical steps to be taken to achieve a large-scale H.323 deployment. Specifically, **FE** offers the following recommendations.

- **Establish the long-term commitment to H.323 as a strategic direction.**

With the confluence of technological changes in equipment and networking, **FE** recommends that the State of Montana set a strategic direction to move toward H.323 videoconferencing. The benefits to the long-term use of IP-based solutions are summarized in Appendix F.1.

- **Prepare an RFP based on a set of standard H.323/H.320 dual mode equipment configurations and secure contract to purchase videoconferencing equipment and maintenance.**

This will allow the state to continue providing new equipment where necessary and will provide the migration capability for the aging H.320 equipment. Where possible, any equipment procured at this point should be compatible with both protocols to enable maximum flexibility. Dual mode equipment is standard on most room systems available today and allows continued use of H.320 with a simple migration to H.323. Additionally, top of the line bridging equipment will host multiple sites in a mix of H.323 and H.320 eliminating in some cases the need for a gateway. The parameters for this RFP should support all of the short-term requirements that the state may have for MDT locations. Further, the RFP should support all equipment necessary for interfacing videoconferencing equipment with the network. **FE** estimates that the overall procurement process would require approximately one-half FTE for three months.

- **Start a demonstration project using H.323 videoconferencing.**

By implementing the first H.323 videoconferencing services under a pilot, ITSD gains valuable experience with a controlled implementation. Once stabilized, early adopters of the H.323 technology will benefit from investing in technology with stronger development potential and longer life cycle forecast. **FE** recommends the project include all MDT sites for the following reasons:

Montana Videoconferencing Strategic Plan

- The total number of endpoints (12) provides a significant but controllable base. Too many endpoints would require a generous amount of operational support. Too few would not generate good baseline data
- The MDT locations are in areas as close to SummitNet II hubs as Vision Net hubs and thereby would not gain considerable cost advantage by using a managed service model. To illustrate this, **FE** created the table found in Appendix I.1.
- The MDT demonstration project can provide a rudimentary comparison when evaluated with the pilot for the Courts. This comparison will be useful for evaluating operational models to move toward.
- The MDT locations themselves are served by T-1 SummitNet II connectivity that may be scaled appropriately to achieve T-1 ATM service or greater.
- MDT has expressed that they have the financial commitment to fund videoconferencing.

FE recommends that the demonstration project incorporate the following steps:

- Scale SummitNet II network appropriately by extending ATM service to each location and adding additional T-1 service at locations in Great Falls, Kalispell, Butte, Glendive, and Billings. Keeping all of the MDT sites on the same network control inter-network issues and focus the pilot on exploring issues of operating and supporting H.323.
- Purchase bridge equipment with capability to connect both H.323 and H.320 systems. This equipment purchase can be delayed somewhat while making use of the existing Ezenia Series 2000 conference bridge by purchasing a gateway and connecting it directly to four RS-449 ports on the conference bridge. This configuration would limit the number of H.323 sites to four. At the point where MDT would like to conference more than four MDT sites together at the same time, it will be cost effective to buy a separate H.323 conference bridge.
- Work with MDT personnel to assist in selection of videoconferencing terminals to meet application requirements expressed through the interview process.
- Define evaluation criteria and data collection mechanisms to include customer satisfaction, network and system utilization, operational support, scheduling, and tracking of technical problems
- Collect data and create results database.

Montana Videoconferencing Strategic Plan

- Set trial period for six months
- Define evaluation criteria and data collection mechanisms
- Collect data and create results database

Equipment requirements for this pilot include the equipment at each site as well as infrastructure equipment. The site equipment and installation costs generally range from \$10,000 to \$60,000 depending on room and application requirements. **FE** recommends that ITSD assist MDT in the selection process. To address the infrastructure requirements, **FE** recommends implementing the Ezenia Encounter 3000 Net Gate and Ezenia Encounter 3000 MCU in order to provide the most cost-effective solution that will work most efficiently with the existing MCU. However, if MDT decides to trial small multipoint conferences of four or fewer end points, the existing Ezenia Series 2000 MCU can be used in conjunction with the Net Gate product. With installation and maintenance, these network infrastructure components will cost approximately \$20,000 for the gateway alone and \$50,000 for the MCU and the gateway. Staying with Ezenia equipment provides the benefit of the staff being somewhat familiar with the manufacturer and operations based on the currently installed unit.

Based on analysis of the current network utilization network at the various MDT offices, and assuming that the current utilization remains constant, it appears that over half of the sites will have adequate bandwidth to run the videoconferencing demonstration projects. Additional analysis revealed that only one of the locations (Glendive) that needs additional bandwidth is not collocated in a community with a Summit Net II ATM hub. To begin the demonstration project, **FE** estimates that incremental network costs will be around \$2,000 per month, based on estimates that four of these can be provided with service for about \$250 per month each while Glendive would cost around \$1000 per month.

- **Develop a detailed conversion plan for METNET sites**

Based on the results of the demonstration project, and the availability of network and funding, the state should develop a detailed plan for migrating all METNET sites to the H.323 equipment. The use of structured change management techniques, along with a high degree of stakeholder involvement through the statewide videoconferencing committee, should enable a successful implementation effort.

As part of this conversion plan, ITSD should assess how videoconferencing services should be provided to those locations. Alternatives to be considered could include closing the site as a METNET location and:

- Reusing the equipment at a new METNET site
- Selling the equipment to VisionNet or another provider and using their services/network when appropriate

Montana Videoconferencing Strategic Plan

- Reusing the equipment as a spares inventory for other METNET sites

ITSD should also assess the need to continue the existing maintenance arrangement for the METNET locations, based on the historical performance patterns and the predicted life of the equipment. It might be appropriate to reduce either the amount of maintenance support or eliminate it for certain sites and/or equipment types. As detailed maintenance records were not available, **FE** is unable to make site- or equipment-specific recommendations.

As a conservative approach, **FE** analyzed each site to determine the cost per site by replacing only the equipment that was absolutely necessary. This would mean that microphones, mixers, and television monitors would be reused while CODECs, control systems, and in some cases the cameras would be replaced. Since configurations vary from site to site, upgrade costs vary widely. **FE** created the table in Appendix K.1 to assist with analysis. This table is a site by site listing of CODEC, camera, control system, and document camera. Where possible **FE** did not suggest replacing equipment. **FE** estimates upgrades, including installation, will cost in the range of \$15,000 to \$30,000 per location and that all 22 locations can be upgraded for approximately \$550,000. Project management costs are not included in this estimate. The amount of project management would be somewhat dependent on the schedule to accomplish these changes, and it is likely to be a full-time job for the first few months of planning and coordination.

Because the core technology will likely implement both H.320 and H.323 standards, addition and changes to the network infrastructure components such as multiprotocol routers, conference bridges, and gateways can be done at a time when it is technically and financially feasible. Appendices N.1 to N.6 indicate the current and planned migration approaches that could be used to accomplish the overall transition.

- **Connect the existing METNET H.320 equipment directly to the network instead of going through the PBX.**

ITSD indicated that this was a critical success factor for their overall videoconferencing program. Uncoupling the existing METNET equipment from the PBX provides two significant benefits. First, resources in the PBX are freed up allowing expansion of PBX voice services. And second, additional METNET H.320 locations could be added easily to any location on the Summit Net II even if a PBX does not exist at that location.

To meet this ITSD goal, **FE** recommends implementing the solution described below, which will minimize the risk of adopting costly or overly complicated technology. Throughout this process it will be important to establish and maintain strong relationships with network providers and equipment vendors. By accepting the responsibility to drive vendor coordination, ITSD reduces the risk of being left

Montana Videoconferencing Strategic Plan

with incomplete solutions. **FE** recommends the following steps to uncouple the existing METNET equipment from the PBX:

- Select and obtain multi-protocol router(s) with a V.35/RS-366 interface to the CODEC and an ATM interface to the Cisco 8510. This option discussed earlier in the report will streamline the implementation.
- Set up two or more test sites with selected equipment and map PVCs from the location to dedicated ports on the MCU.
- Set a test period and gather data on the technology solution
- Evaluate and select equipment based on predetermined evaluation criteria such as capability, time to set up and configure, vendor responsiveness to technical questions and issues of support, cost, etc.
- Implement infrastructure change in the Ezenia conference bridge to work directly over the ATM network.
- Implement the selected technical solution at each existing METNET site.

Based on using equipment pricing and configurations from leading suppliers, **FE** estimates that each system would require a multiprotocol router and a concentrator at each location with multiple rooms. To preserve multipoint conference capabilities and make use of the Ezenia Series 2000 MCU, **FE** recommends eliminating most of the RS-449 ports and installing an ATM card to connect directly to the MCU. Equipment costs for this implementation include \$7,500 at each system location, \$8,000 at each of the three locations with multiple systems, and \$38,000 at each bridge for a total of \$400,000 for all METNET locations. A partial implementation plan could be developed for this option, utilizing the bridge and selected locations. Costs would be proportionately lower based on the number of locations taking this approach. Project management costs are not included in this total, and would probably require a part-time project manager for the duration of the project.

It must be noted, however, that this equipment is completely removed from use once the H.323 videoconferencing equipment is installed. It is not likely that there will be any salvage or reuse value for this equipment. The state should evaluate carefully the value of recapturing the PBX capacity relative to the costs. An alternative approach would be to leave the current environment as it is and use any available funding to purchase new H.323 equipment and phase out the H.320 equipment as soon as possible.

Networking

The unavailability of statewide ATM service, postalized pricing for T-1 access, and the unavailability of SVC's on the Qwest ATM network all contribute to additional complexity in designing and managing the SummitNet II network for videoconferencing services. Given that there may be alternative network providers for the state to consider as part of a managed network services approach **FE** recommends setting strategic direction for the

Montana Videoconferencing Strategic Plan

video networking after an evaluation process using both SummitNet II and services piloted with a third party vendor. In particular, **FE** recommends the following tactical initiatives:

- **Formulate an action plan to insure that the development and implementation of network capabilities to accommodate videoconferencing traffic.**

ITSD needs strong supplier management processes in place to insure that the required level of services and support are being provided. This is typically difficult when dealing with LECs, due to the unavailability of alternative suppliers. However, with the appropriate support from executive management within ITSD, processes to measure vendor performance and escalate issues to the necessary levels within the Qwest corporate structure can be implemented. While tariff offerings and associated service levels are often indicated as limiting factors by the LECs, it is possible to identify process- and technology-related metrics that can be used as an opportunity to strengthen the relationship by focusing on the needs of the end users. These “direct measures of quality” can be established based on end user needs, with preliminary levels of performance reviewed in monthly meetings. Improvement opportunities in the process can often include both the state and the LEC. Clear communication is vital to the successful management and resolution of technical design and operation issues. By developing a clear action plan in conjunction with Qwest, ITSD reduces the risk of issues becoming chronic problems with little or no resolution. **FE** recommends that the action plan include a prioritization of issues, desired outcomes, and target dates for resolution. Further, it is recommended that the plan indicate clear escalation procedures and if possible, penalties for unresponsiveness or failure to produce outcomes.

- **Expand and design the ATM network to accommodate users in the selected H.323 demonstration projects and beyond.**

Utilizing the SummitNet II network for the H.323 pilot will allow ITSD to gain vital information and experience in the effects and support considerations for running H.323 videoconferencing services in a large-scale deployment. A great deal of work needs to be done with Qwest to insure that SummitNet II will deliver the required QoS for both the data network as well as the videoconferencing demands. The state should insure that:

- A specific definition of roles and responsibilities between the state ITSD network managers and Qwest has been completed,
- The parameters that will be used to insure QoS in the provisioning, queuing, and classifying of network capacity and traffic have been defined
- The recommended architecture, including switches, routers, gateways, gatekeepers, CODEC's, and ATM elements has been validated with the appropriate manufacturers (and possibly through independent validation) and tested appropriately prior to any cutovers begin.
- Continue to pursue with Qwest the availability of SVC's and expanded availability of ATM at additional locations across the state.
- Continue to pursue with Qwest the availability of postalized T-1 pricing for access to SummitNet II

Montana Videoconferencing Strategic Plan

While there is every reason to believe that the SummitNet II ATM network will support the videoconferencing traffic, it is a new technology, with new equipment, new processes, and potentially new Qwest support people on the state account. All of which signal the need for extra diligence in planning and execution.

- **Provide support for a managed services trial approach for the Courts**

ITSD should utilize the new requirements of the Courts to trial the “managed services” concept. Since the Courts’ requirements are relatively self-contained, and they have already started implementing several sites through an outside vendor, this is an ideal environment to test the processes, interfaces, and capabilities of a broader “managed services” approach. Unless the cost of providing access from a Courts site to SummitNet II is significantly less than that to a service provider’s network, the state should attempt to utilize the service provider. If possible, the state should continue the partnership that the Courts have established with VisionNet, potentially through the use of special procurement processes if available.

The managed services trial should be conducted for at least six months, at the end of which a formal evaluation process should take place and a determination made as to the implications for further use of the managed services for new and current METNET locations. This approach also may provide the state with additional opportunities to test the flexibility of service providers in obtaining new pricing structures such as postalized access pricing. It would also provide time for the METNET users to become familiar with the managed services approach and to build support for whatever happens at the end of the trial. In accordance with ITSD’s critical success factor to be involved in the planning and design process, **FE** recommends working closely with the vendor to establish the details for the technical operation and interconnectivity of this network to existing services. A series of decisions need to be made concerning the videoconferencing standard used, the amount of interaction required with METNET, the amount of interaction required with other service provider networks, the number and size of anticipated multi-point conferences, the type of scheduling requirements, and the network management required.

Presently, three sites employ the H.323 standard and are served using leased lines from VisionNet. Although publicly available Vision Net videoconferencing services are H.320, VisionNet has been experimenting with H.323 videoconferencing services in preparation for a network wide migration of H.320 sites to H.323. VisionNet offers the Courts pilot sites connectivity through their Accord MCU with VisionNet studios and dial up connections to METNET or other service providers.

As noted from interview comments, the majority of conferences are anticipated to be solely between pilot systems. However, interoperability with other VisionNet sites and METNET sites require coordination of the bridge, gateway, and operations. The videoconferencing equipment used by VisionNet to provide H.323 and the three systems purchased by the Courts, do not use the proprietary control

Montana Videoconferencing Strategic Plan

system used by VisionNet integrated instruction systems found in some schools and studios. Interaction in point to point calls between these sites will allow far end control via the H.281 standard. However, interaction with VisionNet integrated systems will be limited in the far end control capability. The H.323 video sites will not be able to control the integrated instruction systems and the integrated instruction systems will not be able to control the H.323 sites. When interconnecting the H.323 Courts sites with METNET sites interoperability issues will be MCU centric. Depending on the feature set of the MCU, far end control may be available. Also, at the MCU will be the ability to specify capability to handle different bit rates and different standards. If this is not done in every bridge used, then videoconferencing end point will experience problems receiving video from other sites.

Since the majority of the videoconferences are anticipated to be point to point, scheduling requirements will remain at a minimum provided VisionNet can maintain the routing capability it has achieved thus far in the pilot. At present VisionNet scheduling is tied to their proprietary control software in the integrated instruction systems. No scheduling package is currently available for the VisionNet H.323 products, although VisionNet did indicate that development efforts were underway to create this capability. When not done through the proprietary control system, scheduling of MCU calls can be achieved through vendor specific software. VisionNet is currently developing a scheduling package for their H.323 sites. **FE** recommends ITSD work closely with VisionNet on their new scheduling project in order to help focus efforts around scheduling tools for the Courts units and ensure development offering maximum compatibility.

- **Strengthen existing relationships, explore interoperability alternatives, and establish or revise MOUs as required**

The state should approach the growth of videoconferencing as an opportunity to expand the relationships that it has with existing suppliers and partners (EMTN, the universities, VisionNet, Mid-Rivers, National Guard, etc.) and identify new relationships where possible. The general approach should be essentially the opposite of the “field of dreams” philosophy – don’t build it if it already exists and can interoperate. For state agency requirements that are in locations that do not have METNET service, the first attempt should be to find an existing partner to interoperate with. This may require negotiations on scheduling processes, location access/security issues, and operational issues. But it is well worth the effort to attempt to interoperate before either turning down a valid agency/educational need, or building new capabilities where others already exist.

The state should review the existing relationships with service providers and universities and update them to develop stronger partnerships. Many of the MOUs are very old and should be updated to reflect current expectations and requirements. The MDT and Courts projects should both be supported by documented agreements.

Montana Videoconferencing Strategic Plan

- **Evaluate alternative network access capabilities.**

The state should investigate the potential use of DSL as an alternative to T-1 access for those locations that would be very costly to provision under standard T-1 access. While the use of “commercial-grade” DSL is less common than T-1 or even fractional T-1 services, it is an emerging capability that should be tested. There is a need to support bi-directional 768 transfer rates, which may limit the availability of DSL products. The cost of this bandwidth should be substantially lower than a full T-1, and should provide sufficient bandwidth for acceptable videoconferencing quality. End-to-end QoS information may not be available since the DSL providers don’t typically provide access to their network management platforms but still could be considered where economically advantageous.

- **Establish a “partnership forum” for videoconferencing service providers.**

This initiative will have some overlap with a recommended initiative within the equipment area. Through the initiative of a statewide taskforce and advisory committee, regular meetings on a bi-annual basis would benefit all videoconferencing service providers. The state would ensure that any technical or operational inconsistencies are addressed directly and in coordination with all parties involved. All providers would have an opportunity to share strategic and tactical direction that would impact interoperability or partnerships.

Policy

The proper choice of networking and equipment technologies, as well as establishing the right partnerships and interoperability agreements will provide a strong foundation for videoconferencing services. The sharing of success stories and appropriate marketing will enable greater utilization where it supports the client business needs. But there is always resistance to change and to using new technologies.

- **Increase the awareness of the benefits of videoconferencing within the state government agencies.**

The state should develop a sponsorship package that can be used to obtain either strong policy statements from on the use of videoconferencing as a travel replacement, as well as obtaining support for publicizing the benefits that it can bring. Top-level sponsorship goes a long way in terms of changing behaviors. The absence of it can also send a strong signal.

Montana Videoconferencing Strategic Plan

- **Establish a statewide advisory/user group**

An ongoing regular meeting of representatives from the key groups utilizing METNET and other videoconferencing services would build on the information collected by **FE** during this assessment and would provide the opportunity for feedback to the state on the delivery of videoconferencing services. Further, this group could share ongoing success stories, as well as provide a forum for discussing emerging technologies such as desktop videoconferencing. . The state would be able to better ensure that any technical or operational inconsistencies are addressed directly and in coordination with all parties involved. All users would have an opportunity to share strategic and tactical directions that might impact interoperability or partnerships. The formation of this group might also enable the state to investigate the potential of aggregating demand for both equipment, network, and/or services across not just state users but to include local governments and schools in order to negotiate a more favorable prices with potential suppliers.

Process/Organization

FE recommends that strategic direction for organization and process move toward establishing the best value proposition for delivering the highest quality of easy to use services achievable within reasonable financial constraints.

- **Continue to provide high-quality METNET services.**

Until sufficient information is available regarding the viability of a managed services approach (minimum six months), **FE** recommends that the current METNET services continue to be managed as they are today. While every effort should be made to further reduce costs, there is strong user sentiment that the current approach to providing METNET is in fact a compelling reason for them to continue to use METNET.

- **Utilize a hybrid organizational approach to provide videoconferencing services while the feasibility of managed services is being evaluated**

As mentioned several times previously, the current approach to providing METNET videoconferencing services has a high degree of user satisfaction. While the evaluation of the managed services project for the Courts is underway, ITSD should continue to support METNET in the way it is being done today. Other than considering the process and operational changes recommended in this report, major changes in structure or approach should wait until the evaluation of the managed services project is completed. If it is successful, changes to process and staffing for the expanded managed services environment will be necessary, and ITSD should focus on the core support functions of client satisfaction, marketing, billing, and planning. This is consistent with the direction stated by ITSD management during the analysis phase of this project. **FE** does not recommend a total and complete outsourcing of all functions and responsibilities, as it will remove the customer

Montana Videoconferencing Strategic Plan

interface from ITSD. **FE** feels that the customer interface is vital to insuring that services mandated under SB 131 are being provided appropriately.

If the evaluation of the Courts project indicates that the managed services environment should not be continued, then ITSD should assess the staffing and skill levels necessary to support the level of services that are being provided at that point. Specific staffing levels are difficult to forecast without further details, but it is anticipated that additional staff would be required if the projected volume of videoconferencing actually materializes. Changes in tools and processes, particularly in the scheduling and control area, may generate sufficient improvements in productivity to offset the need for additional staff.

- **Define and measure optional service levels for current users.**

Changes to the operational model should be evaluated as technology changes occur which allow higher reliability and create less dependence on an onsite support person for each videoconference location. This “premium” service could be priced to recover its costs and the decision should be driven to the users of the service as an option within the suite of services available. ITSD should also move carefully towards reducing the amount of intervention and involvement of its centralized METNET staff in each videoconference, both from a scheduling as well as an operational standpoint. Include some specific recommendations as to how/where. This is obviously a very delicate situation as the client support for such involvement (if it is necessary for high quality video calls) is overwhelming. Service Level Agreements should be put in place with each client agency/entity as well as with each supplier.

- **Restructure the chargeback process to be primarily subscription-based.**

The chargeback model should be restructured to create two options for METNET – a subscription option and a usage-based option. The subscription approach would allow essentially unlimited use of the network for a fixed fee. The overall subscription fees should cover the fixed and variable costs of the services provided and would be negotiated with the primary client groups based on historical usage. This may generate more utilization of the network and equipment as well as providing added value overall to those entities. Agencies/clients with small usage would be charged based on a market-based price, which could be very comparable to the current METNET charges. The ownership and funding of the equipment should be either handled by grants/legislative funding, or be supported by the client if it is a dedicated site.

Montana Videoconferencing Strategic Plan

As nearly every process can be viewed as an initiative, **FE** recommends special consideration be given to the following areas:

- **Increase the marketing of videoconferencing services.**

While the awareness of METNET appears to be high among the agencies using it today, it is likely that METNET usage could be expanded through a more aggressive approach to educating the agencies on the potential values of videoconferencing to their operations. With a state as large as Montana, there are advantages from a travel-replacement standpoint as well as for maintaining levels of communications. Appendix D.1 contains some information that agencies can consider in developing their business case justification for videoconferencing services. While most organizations use travel-replacement as the starting point for justifying videoconferencing, the state has the opportunity through the initiatives that the Courts and MDT have identified to show how the business processes can be transformed by the introduction of this technology.

While **FE** believes that there is “repressed demand” for videoconferencing capabilities, **FE** does not recommend simply selling the service for the sake of increasing utilization. This solution, as any other, should only be utilized where it brings a positive value proposition to the client.

Initial marketing efforts should focus on identifying specific customer requirements and should start by building on the results of the focus group sessions conducted during the 2002 Video Forum. It will require additional marketing effort and resources than have been available in the past, but there should be some “low hanging fruit” applications that can be championed and advertised to build the “sales” momentum. Active marketing of the benefits of videoconferencing, as well as support in helping agencies create viable business cases, should be provided. Use of the state Intranet for educating agencies on success stories as well as for operational support should also be considered

- **Evaluate and obtain scheduling software**

If the decision is made that a substantial amount of the current METNET services will continue to be managed by ITSD as it is today, there is a need to upgrade the scheduling/tracking capabilities. If a managed services solution were preferred, this initiative would shift to the service provider to execute.

When comparing the effort and expense of developing a scheduling package to the available alternative on the market, **FE** recommends the purchase of commercially available software by a third party vendor. These vendors provide comprehensive control over most of the videoconferencing end point and infrastructure equipment on the market. And more are being added as these products mature. The current METNET scheduling/billing software was developed in-house using COBOL at a time when the few commercial software packages available were in early stages of

Montana Videoconferencing Strategic Plan

development. Further, videoconferencing vendors are developing vendor specific scheduling and management software for end point management. These vendor specific packages do not take into account scheduling and management of infrastructure components such as conference bridges but do tend to run on the low end of the cost scale from about \$1,500 to \$43,800 depending on the number of sites. To account for the infrastructure components and to offer a more customizable implementation, **FE** recommends purchasing scheduling and management software from a third party vendor. These costs usually range from \$20,000 to over \$100,000. ITSD should expect to find a scheduling and management package to suit their needs for approximately \$45,000 to \$55,000 plus the costs of implementation and hardware, if needed.

- **Provide H.323 User Training**

While there may be some value in providing additional training for the H.320 environment, as the state moves into a deployment of H.323 equipment it should insure that there is a robust training capability and that the benefits of H.323 are in fact realized through the awareness of features and capabilities of the new technology.

- **Insure a high level of technical support**

Careful planning of the support functions to be provided during transition should be done. It will most likely be beneficial for the state to provide a high degree of support for the initial installations so that the post-pilot installations have the track record of early successes to ride upon. . Equally important will be the trouble tracking process which should provide valuable information on the type and amount of support required.

As METNET is in transition to a H.323 based platform, particularly in the post-warranty timeframe, the skill sets of the support team will need to be more oriented towards data networking competencies. LAN/WAN expertise will be necessary to integrate these video teleconferencing requirements into the SummitNet II backbone and local data networking distribution systems.

- **Plan and train for bridging/gateway management**

This will become critical for the H.323 implementation, as the network-network interconnects (NNI) between ATM networks and between H.323 and H.320 networks will require careful planning. The selection of bridging and gateway/gatekeeper capabilities should be done in a way that minimizes the amount of concurrent change required to adopt the H.323 technology. With transition from H.320 to H.323 being a series of progressive steps on the endpoint side, it will be extremely beneficial to invest strengthen the infrastructure through a multi-standard conference bridge with room for growth. The state can take advantage of on the strength of the existing bridge by collocating and integrating the two bridges with a direct connection.

Montana Videoconferencing Strategic Plan

- **Evaluate and be prepared for the demand for desktop videoconferencing**

This is an emerging trend that will gather momentum and popularity as the availability of higher bandwidth network access becomes more prevalent. Much of the desktop videoconferencing is likely to be across the Internet, as employees and students become familiar with the low-cost camera and software technologies that are becoming ubiquitously affordable. As usage increases, it is possible that LAN administrators and help desks will sense the first evidence of network congestion, and should be ready to identify the potential implications on both the LAN and the WAN. Some organizations manage this through proactive policy statements and educating users on the benefits of desktop conferencing but also informing them of the standards and requirements (and incremental costs if network upgrades are required) related to the use of that technology. Others go further and support the policy statements through the implementation of desktop management tools (such as with Microsoft System Management System – SMS, HP Top Tools/OpenView, or other similar management system). In those environments the IT organization can control most “unauthorized” use. Desktop conferencing may also play into an overall long-term e.government strategy where citizens use it as one of their paths to obtaining e.government services.

There is also a higher quality, more expensive desktop conferencing capability that may be useful to technical support people or to those employees/users who have the need to interact with many different locations but need more of a high-bandwidth quality. These would be carefully managed and deployed by ITSD as part of the overall standards compliance process.

FE believes that the initial use of the low-cost desktop videoconferencing devices will grow slowly at first but once it becomes a comfortable technology there is the potential for significant usage, and resultant impact on the network. Thus, the overall cost to the state could be substantial and could even impact citizen access to state systems. Again, awareness and education of uses, possibly through one of the videoconferencing advisory groups or committees to be established, will be of great value in quantifying the demand and communicating the issues.

Conclusions

The State of Montana has established a very strong reputation of quality for the METNET videoconferencing services, and has been consistently praised by the users for the client-focused attitude and approach that the ITSD team provides. The state has an opportunity now, created by events in the administrative area (expiration of purchase contracts) and technology area (emergence of H.323-based technologies) to insure that the needs of its clients continue to be met into the future. The plan above outlines an aggressive but orderly

Montana Videoconferencing Strategic Plan

approach to addressing the technology, network, process, and organizational implications of future METNET videoconferencing requirements. **FE** has every reason to believe that the state will be successful in following the course of action and achieving its goals.

Montana Videoconferencing Strategic Plan

Appendices

Appendix A.1 - Utilization Hours by Site
Appendix B.1 - Community Comparison of Services
Appendix C.1 - Cost Burden and Service Fee Comparison
Appendix C.2 - Operational Function Comparison
Appendix C.3 - Scheduling Process Comparison
Appendix C.4 - Technical Statistics Comparison
Appendix D.1 - Videoconferencing Benefits
Appendix E.1 - Video Forum Small Group Comments
Appendix F.1 - Comparison of ISDN and IP
Appendix G.1 - MCU Comparison
Appendix H.1 - Scheduling and Management Software Vendor Comparison
Appendix H.2 - Software and Hardware Requirements for Management Software
Appendix I.1 - MDT Locations with Comparative ATM Hub Locations
Appendix J.1 - Non-Profit Videoconferencing Providers in Montana
Appendix J.2 - Vision Net Videoconferencing Coverage in Montana
Appendix K.1 - Considerations for Outsourcing Decisions
Appendix L.1 - METNET Site Upgrade Cost Estimate
Appendix M.1 - Implementation Process

Montana Videoconferencing Strategic Plan

Appendix A.1 - Utilization Hours by Site

<u>Site Designator</u>	<u>1Q 2002</u>	<u>4Q 2001</u>	<u>3Q 2001</u>	<u>2Q 2001</u>	<u>1Q 2001</u>
MCS _ Helena 1 Helena Control site	5	2	0	1	0
HCT - HLNA Helena College of Technology U of M	101	102	60	117	117
DOT - HLNA Helena-Dept of Transportation	0	0	0	0	0
DPH - HLNA Helena-Dept of Health and Human Services	110	82	24	97	70
MSU - BZMN MSU Bozeman-4 Sites	240	324	145	172	246
UOM - MSLA Missoula-5 Sites	250	396	165	258	336
EMC - BLNG Billings-Eastern Montana College	203	304	143	148	225
FVC - KALS Kalispell-Flathead Community College	125	119	76	114	170
MCC - MICY Miles City-Miles Community College	71	60	31	43	74
GCT - GRFL Great Falls-MSU College of Tech	280	333	177	212	239
NMC - HAVR Havre-MSU Northern	85	80	41	47	96
WMC - DLLN Dillon-Western Montana College of U of M	50	18	16	28	43
WSH - WRMS Warm Springs-State Hospital	5	11	10	5	3
MDC - BLDR Boulder-Montana Developmental Center	0	4	2	2	0
BMT - BUTTE Butte-Montana Tech U of M	77	167	88	89	107

Montana Videoconferencing Strategic Plan

<u>Site Designator</u>	<u>1Q 2002</u>	<u>4Q 2001</u>	<u>3Q 2001</u>	<u>2Q 2001</u>	<u>1Q 2001</u>
MSP - DRLD Deer Lodge-Montana State Prison	0	0	0	1	6
EMTN - BLNG Billings-Eastern Montana College	116	65	59	103	88
Site Hours	1716	2064	1033	1434	1817
Alliance Partners					
REACH - GRFL Great Falls-Alliance Partner	36	38	2	34	22
STP/SMT	1	0	0	0	0
St Vincent-BLNG	9	3	2	19	4
OHA	118	10	59	187	56
Tribal Colleges	0	13	6	0	2
AT&T Usage	118	141	61	88	151
Vision Net	92	96	10	2	0
SPRINT	6	5	4	0	2
TOTALS	2095	2369	1176	1763	2054

Montana Videoconferencing Strategic Plan

Appendix B.1 - Community Comparison of Services

Location	METNET	SUMMITNET II Service	Vision Net	EMTN	National Guard	PHTN	St. Peters	REACH
Absarokee						1		
Anaconda		FR 56Kx4			T-1		1	
Arlee			1					
Ashland						1		
Bainville			1					
Baker		FR 56Kx2		1				
Belt			1					
Big Sandy								1
Big Timber		FR 56Kx2		1				
Billings	1	ATM-Mult spd	3	3	T-1	1		
Boulder	1	FR T-1x2						
Box Elder		FR	2					1
Bozeman	4	ATM-Mult spd	1		T-1		1	
Bridger						1		
Broadus		FR 56Kx2						
Brockton			1					
Browning		FR T-1x2, 56Kx1	2					
Butte	1	ATM			T-1	1		
Centerville			1					
Chester		FR 56Kx2	1					1
Chinook		FR T-1-1x1, 56Kx2	1		T-1			
Choteau		FR T-1x2, 56Kx3						1
Circle		FR 56Kx3						
Colstrip		FR 56Kx2		1				
Columbus		FR T-1x1. 56Kx2		1				
Conrad		FR 56Kx5						1
Crow Agency		FR 56Kx3	1					
Culbertson		FR 56Kx2		1	T-1			
Cut Bank		FR T-1x1, 56Kx3	1					1
Deer Lodge	1	FR T-1x2, 56Kx3						
Dillon	1	ATM DS-3			T-1			
Dodson			1					
Ekalaka		FR 56Kx1						
Ennis			1					
Eureka		FR 56Kx2	1					

Montana Videoconferencing Strategic Plan

Location	METNET	SUMMITNET II Service	Vision Net	EMTN	National Guard	PHTN	St. Peters	REACH
Fairfield			2					
Flaxfille			1					
Forsyth		FR 56Kx4						
Fort Belknap			1					
Fort Benton		FR 56Kx3	1					1
Fort Worden			1					
Frazer			1					
Froid			1					
<i>Glendive</i>		FR T-1x4, 56Kx8		1	T-1			
Gildford			1					
Glasgow		FR T-1x1, 56Kx6	3	1	T-1			
Great Falls	2	ATM T-1x9, 56Kx15	4		T-1			2
Hamilton		FR T-1x1, 56Kx5			T-1			
Hardin		FR T-1x1, 56Kx1	1			1		
Harlem		FR						
Harlowtown		FR 56Kx3			T-1	1		
Havre	1	ATM T-1x3, 56Kx11	5		T-1			1
Hays			1					
Hearte Butte			1					
Helena	3	ATM OC-3	1	1	T-1	2	1	
Hinsdale			1					
Hysham		FR 56Kx1						
Inverness			1					
Joplin			1					
Jordan		FR 56Kx1						
Kalispell	1	ATM T-1x10, 56Kx6			T-1			
<i>Kremlin/Gilford</i>			1					
Lame Deer		FR 56Kx3	1					
Lewistown		FR T-1x4, 56Kx4	1		T-1	1		
Libby		FR T-1x2, 56Kx4			T-1			
Livingston		FR T-1x1, 56Kx2			T-1			
Lodge Grass			1					
Lovell WY				1		1		

Montana Videoconferencing Strategic Plan

Location	METNET	SUMMITNET II Service	Vision Net	EMTN	National Guard	PHTN	St. Peters	REACH
Malta		FR T-1x1, 56Kx1	2		T-1			
Medicine Lake			1					
Miles City	1	ATM T-1x4, 56Kx6		2	T-1	3		
Missoula	4	ATM OC-3	1		T-1		1	
Opheim			1					
Outlook			1					
Pablo		FR 56Kx3	1					
Philipsburg		FR 56Kx2	1					
Plentywood		FR T-1x1	1					
Polson		FR T-1x1, 56Kx5						
Poplar		FR	2					
Power			1					
Pryor			1					
Rapelje			1					
Red Lodge		FR 56Kx3						
Rocky Boy		FR 56Kx1	1					
Roundup		FR 56Kx4						
Rudyard			1					
Ryegate		FR 56Kx1						
Saco			1					
Scobey		FR 56Kx1	3					
Shelby		FR T-1x2, 56Kx6						1
Sidney		FR 56Kx6		1	T-1	1		
Stanford		FR 56Kx1						
Sunburst			1					
Superior		FR 56Kx3						
Terry		FR						
Thompson Falls		FR T-1x2, 56Kx1	1					
Townsend		FR T-1x1, 56Kx2						
Virginia City		FR 56Kx4						
Warm Springs	1	FR T-1x1						
Westby			1					
White Sulpher Springs		FR 56Kx3						
Whitewater		FR 56Kx3	1					
Wibaux		FR 56Kx2						
Winifred			1					

Montana Videoconferencing Strategic Plan

Location	METNET	SUMMITNET II Service	Vision Net	EMTN	National Guard	PHTN	St. Peters	REACH
Winnett		FR 56Kx1						
<i>Wolf Point</i>		FR T-1, 56Kx4	1					
Worden			1					

Multiple speeds indicated multiple locations in one city

County Seats shown in bold, *MDT locations shown in italics*

Montana Videoconferencing Strategic Plan

Appendix C.1 - Cost Burden and Service Fee Comparison

	Status	Network Cost Burden	Equipment Cost Burden	Central Operation Cost Burden	Local Operation Cost Burden	Network Fees	Site Fees
IHETS-ITN Indiana	Operational	Recover both recurring and non-recurring charges for service based on data only, video only, and video and data services.	Local school, state agency purchase and maintain terminal equipment. Network interface provided	State budget - FY2001 was \$ 3,281,200 plus one time \$ 1,920,000.	Equipment, support personnel	\$ 16,500. Per year	Local option
DDN South Dakota	Operational	State funded for all K-12 schools; charged back to agencies as part of data service	State funded for all K-12 schools; universities and state agencies bear cost themselves	State provides first level support for network but does not know how it will handle bridging and scheduling	Each site bears cost of local operation and coordination	\$30.00 per hour per site for in-state conferences for users not covered under other contract -for-use agreements	Determined and billed by site.
METNET Montana	Operational	Initial funding provide by state funds; now recovered though usage charges	Initial funding provided by state funds; now recovered though usage charges	Initial funding provided by state funds; now recovered though usage charges	Each site bears cost of local operation; however, METNET bills for and passes back a \$15.00 per hour Site Management Fee	Charges applied on a per site per hour charge \$35.00 for 336 kbps \$37.50 for 384 kbps \$50.00 for 672 kbps \$80.00 for 1344 kbps	\$15.00 per site per hour
WEN Wyoming	Operational	Cost recovered in biennium budget for all K-12 schools	State funded for all K-12 schools	Shared costs currently supported in biennium budget	K-12 schools bear cost for space, phone line, and technician	Not charged	Users are not presently being charged.
WVCS Wyoming	Mature network still in operation	Cost recovered from fees	Site bears equipment cost- State provided contract and found second-hand equipment	Cost recovered from fees	Telecommunications assistant costs recovered from usage fees	Prices vary based on entity using system. Price tiers include Educational, Government, and Private Sector entities.	Determined and billed by site management

Montana Videoconferencing Strategic Plan

	Status	Network Cost Burden	Equipment Cost Burden	Central Operation Cost Burden	Local Operation Cost Burden	Network Fees	Site Fees
Louisiana	Operational	Costs for access and network use	Site purchases own equipment	One FTE recovered in network costs Operations are outsourced to BellSouth	Site pays for own support	\$750 one-time setup fee \$500/month/site for access \$600/month/site for unlimited use \$.33/min for measured use	Determined by site

Montana Videoconferencing Strategic Plan

Appendix C.2 - Operational Function Comparison

	User Scheduling	System Operation During Conference	Material Distribution and Coordination	On Net Multi-Site Bridging	Network Support	Equipment Support
IHETS-ITN Indiana	(1) Point to point conferences are scheduled by the end points (2) Multi-point conferences are scheduled via an online form	Help desk at central location for network issues, local trained personnel for site issues	Major use is education, so instructor or originating site is responsible	Central function-Scheduling on web	Support from Helpdesk in Indianapolis. Compressing network so central location can troubleshoot.	End appliance is locally supported
DDN South Dakota	(1) Online form preferred (2) e-mail requests and (3) telephone requests accepted	Site Coordinator designated by each school has responsibility to monitor facility and train users	Site Coordinator has responsibility to arrange and provide logistical assistance for participants	Centralized scheduling, billing, and reporting are handled by DDN staff	DDN staff provide first and second level support functions for network equipment and leased network	Site coordinator works in conjunction with technical DDN staff who provide first line assistance and operate from Mitchell and Pierre
METNET Montana	(1) Telephone (2) Fax (3) e-mail	Site Technician	Responsibility of the originating site to coordinate with receiving sites	Centralized scheduling, billing, and reporting are handled by METNET staff	ITSD staff provide first and second level support for network	Site Technician works in conjunction with METNET staff to provide first line assistance
WEN Wyoming	(1) Online form (2) e-mail (3) telephone	Site Technician required for operation at a cost of \$10.00 per hour	Responsibility of originating site to coordinate with receiving sites	All multi-point classes scheduled through Administration and Information	Network is supported by state telecommunications department	Site Technician provide first level support and coordinates with technical support from the manufacturer

Montana Videoconferencing Strategic Plan

	User Scheduling	System Operation During Conference	Material Distribution and Coordination	On Net Multi-Site Bridging	Network Support	Equipment Support
WVCS Wyoming	Using the videoconference request form (1) mail, deliver, or fax to scheduler	Telecommunications Assistant covered in the price of the conference	Responsibility of originating site to coordinate with receiving sites	Scheduling remains the same. Operation is centralized	Network is centrally supported by the WVCS staff	Telecommunications Assistant provide first level support
IVN North Dakota	PtP scheduled by end-point Multipoint scheduled by web form	Local site tech plus centralized phone network support	Responsibility of originating site to coordinate with receiving sites	Central function-Scheduling on web	State staff	Qwest has supply, set-up and support State contract

Montana Videoconferencing Strategic Plan

Appendix C.3 - Scheduling Process Comparison

	Software Tools	Priority User(s)	Other Users	Priority Time Slots	Special Reservation Window	Request Deadline	Confirmation Returned	Ad Hoc Policy
IHETS-ITN Indiana	First Virtual Click -to-meet for H.323	Higher education. Bandwidth not an issue	Libraries, state offices, local government	None		Since education is most of use, semesters are scheduled 6 mos in advance. Reasonable advance time was suggested	By e-mail	Traffic is unknown because PtP is set up w/o intervention. Data network traffic is monitored.
DDN	TODD	K-12 students and staff; education and government administration; Preemption allowed by Governor	(1) South Dakota University System (2) Private and Tribal Higher Education Systems (3) South Dakota Technical Institutes (4) Private, Tribal, Home, and Parochial Schools (5) Government (6) Business and Industry	7:00 a.m. – 8:00 a.m.: Administrative conferences for education and government 8:00 a.m. – 3:00 p.m.: Programming delivered to K-12 students and staff, originating from K-12 schools or other educational institution/entities 3:00 – 5:00 p.m.: Administrative conferences for education and government 5:00 – 10:00 p.m.: open to all users. Although K-12 education continues to be highest priority, lifetime learning opportunities, career enhancement seminars, and business and industry training are considered vital to the state's economic development efforts. Those events can occur during this time period based on site approval and availability	Educational users have priority to schedule video sessions for events occurring between 60 –120 days out.	48 hours before a scheduled event.	Within 24 hours for normally scheduled conferences. Ad-Hoc scheduling confirmation will be immediate	Yes by telephone arrangement only. The user is required to call all sites to verify availability and alert the site coordinator that an Ad-Hoc/last minute request is in the processes.

Montana Videoconferencing Strategic Plan

	Software Tools	Priority User(s)	Other Users	Priority Time Slots	Special Reservation Window	Request Deadline	Confirmation Returned	Ad Hoc Policy
METNET	In house developed in COBOL	Universities, state government	Any direct state business	None	90 day window priority for university sites	48 hours prior to meeting	Within 24 hours for normally scheduled conferences	Scheduled by calling METNET operations
WEN	TODD	K-12 students and staff; Dual Enrollments; Courses offerings from UW or CC	Home School students	7:00 a.m. - 5:00 p.m. (M-F) K-12 takes priority 7:00 a.m. - 10:00 p.m. (M-F) Concurrent/Dual enrollment have equal weight with 9-12 priority use 5:00 p.m. - 10:00 (M-F, weekends, and holidays) Course offerings from UW or CC		Fifteen calendar days before an event for guaranteed reservation. Scheduling 7 days or less available under ad hoc policy	Within 24 hours for normally scheduled conferences	Scheduling seven days or less of the date of a conference can be accomplished by the requester: (a) contacting network control to determine site availability; (b) contacting the sites to seek permission to use the rooms; (c) contact network control to schedule

Montana Videoconferencing Strategic Plan

	Software Tools	Priority User(s)	Other Users	Priority Time Slots	Special Reservation Window	Request Deadline	Confirmation Returned	Ad Hoc Policy
WVCS	?	Educational and government entities	Qualified private sector entities	7:00 a.m. - 12:00 p.m. State agencies, Community Colleges, and Sponsored Private Sector Entities 12:00 p.m. - 10:00 p.m. University of Wyoming	University of Wyoming and community colleges have until 60 days prior to the beginning of each semester to develop and schedule course programming. After this window, any time not contracted is available on a first-come, first served basis	Fifteen days prior to the scheduled event	Within 24 hours for normally scheduled conferences	
IVN North Dakota	TODD	Educational and government entities	Qualified private sector entities	Tuesday and Thursday morning reserved for state gov't and NDU System events				Any time with QoS registered with gatekeeper

Montana Videoconferencing Strategic Plan

Appendix C.4 - Technical Statistics Comparison

	Video Standard	Network Backbone	Typical Conference Bit Rate (in kbps)	Other Rates Offered (in kbps)	CODEC Equipment Manufacturer	Bridge Equipment	Number of Sites on Network	Average Utilization
IHETS-ITN Indiana	H.320 with fast progress to H.323	ATM now, compressing to dedicated T-1 or above to each site	384k multipoint		Polycom is recommended for H.323 implementation	Moving to Accord bridges Have 1-32 +1-40 port VideoServer (H.320) in place now	160 video Over 700 data only	Tracking done by other department.
DDN South Dakota	H.320	ATM	384		VTEL	9 VideoServer bridges (5 in Mitchell and 4 in Pierre)	Over 220	
WEN Wyoming	H.320	ATM T-1			TANDBERG		92	1800 hours per month (one hour counted for each site in use)
METNET Montana	H.320	Switched access T-1	336	384, 672, 768, 1344	CLI, VTEL	1 VideoServer bridge located in Helena	22	700 hours per month (on hour counted for each site in use)
WVCS Wyoming	H.320	Switched access T-1			TANDBERG, VTEL	2 MCU II bridges (1 in Casper and 1 in Cheyenne)	29	2200 hours per month (one hour counted for each site in use)
IVN North Dakota	Mix H.320/H.323	ATM	768 School 384 General Usage		State approved vendors include Polycom and PictureTel	Accord MCU	80 - 40 are now H.323 Expect to add 120 locations summer 2002	

Montana Videoconferencing Strategic Plan

Appendix D.1 - Videoconferencing Benefits

This section is based on information gathered by Wainhouse Research, Inc.

Videoconferencing has been viewed traditionally as a substitute for travel. A major reason for this limited focus is that it is relatively easy to quantify the costs of videoconferencing equipment and services as well as to document the cold hard costs of travel. Comparing these two hard numbers has often been enough to justify the investment in conferencing. However, we also believe that in today's business climate, organizations should take a more enlightened view of the true costs of travel as well as the wide variety of benefits that can be realized through the adoption of conferencing throughout the enterprise.

Videoconferencing reduces travel costs

Videoconferencing offers many benefits, including significant cost savings thanks to its cost-avoidance aspects. Specifically, by converting a travel meeting into a videoconference, organizations can realize both hard savings (flights, hotel, etc.) and soft savings (saved employee time). According to a survey conducted by WorldCom, Meetings in America, the average domestic business trip has a hard cost of \$1,334 per meeting participant. This is a sum of the cash outlay for airfare, hotel, meals, rental cars, taxis, etc. averaged over a large number of business trips. Related soft costs are not reflected in this number. Soft costs can be calculated by taking the average traveler's hourly salary, adding 25-35% for benefits and overhead, and then multiplying by the number of hours of productivity lost in a round trip. For many individuals, the WorldCom study showed 15-20 hours of lost productivity per trip, leading to an additional hidden or soft cost of approximately \$700-1000 per business traveler.

Videoconferencing enhances employee quality of life

A multitude of studies have been conducted on the effects of business travel on personal and family stress. In one published report, more than 73% of business travelers found general business travel to be a source of stress. In fact, more than half of that 73% reported that business travel was extremely stressful and that it negatively impacted their lives, their sleep, their well-being, and their general performance both before and after their journeys. 76% of business travelers reported that they suffered from more health problems when they traveled. In addition, a World Bank Survey reported that frequent business travelers are three times more likely to use their corporate health insurance program for mental health treatment. Hence, as a travel substitute, videoconferencing helps decrease stress, improve family relations, and avoid physical and mental health problems.

Videoconferencing saves time and boosts productivity

Time savings alone often outweigh the direct cost savings offered by videoconferencing. In short, videoconferencing can reduce employee "downtime" significantly. According to the WorldCom study, an employee invests an average of 21 hours in a meeting that involves travel vs. four hours in a videoconferencing-based meeting. Hence, each travel meeting converted to a videoconference saves as much as two days of work time. (We are

Montana Videoconferencing Strategic Plan

aware that some people are able to use some of this travel time to accomplish some work-related tasks through the use of laptops, PDAs, and other tools.) When you multiply this savings per meeting by the number of meetings per year a manager may attend, the additional time available for productive work is considerable. By applying these savings figures across the number of traveling professionals inside an enterprise, the effect on the global organization becomes quite significant. Today's competitive business environment demands that organizations and their partners operate as efficiently and effectively as possible. The fact that an organization uses a cost and timesaving technology such as videoconferencing makes a strong statement about the priorities and operating habits of that company. Gaining a reputation for being cost-conscious and resourceful can only yield positive reactions from employees, partners, and even shareholders.

Videoconferencing enhances customer relationships

One reason people turn to videoconferencing is to gain immediate, ad-hoc and fully interactive access to their contacts, regardless of geographical location. The concept here is not to use videoconferencing as a substitute for business travel, but rather as a substitute for an ordinary telephone call. Although a voice-only telephone call does allow easy and one-dimensional communications, the ordinary phone call cannot provide the face-to-face capabilities offered by video. And unlike travel, a video call can be ad-hoc and unscheduled, much like an ordinary voice call. With videoconferencing, a user can be "in front" of a client in minutes after making the decision to do so. Video offers increased impact and focus to any conversation as well as enhanced persuasiveness and generally leads to enhanced trust between partners and suppliers/customers.

Videoconferencing speeds time-to-market

Videoconferencing can drastically improve the internal communications operations of any enterprise, thereby speeding decision-making and making teams more effective. This is especially true in the area of project management. While it is common to categorize these benefits as relating to travel avoidance, the major benefit to be derived is often the decrease in time-to-market (shorter development cycles) resulting from the use of conferencing tools. Companies and teams that understand the strong relationship between time-to-market and profitability will typically achieve superior financial results. By cutting time-to-market, engineering and marketing teams can introduce more products to the market in a given period of time. And by introducing products to the market quickly, companies can avoid or at least delay competitive pressures that may force lower prices and decreased margins. The first few months of a product's market availability can be the major determinants of a product's overall life cycle profitability. This is particularly true for high-tech products and services.

Videoconferencing makes recruiting faster and more efficient

The use of videoconferencing as a recruiting tool is one of the fastest growing applications of the technology. Making this application even easier to implement are the thousands of public rooms available for rental throughout the world. These "for-rent" videoconferencing suites make it practical for an employer to run a "virtual" recruiting function that is both convenient and cost effective for all parties involved. By converting

Montana Videoconferencing Strategic Plan

first-round interviews into “virtual” interviews, companies can limit travel investments to those candidates worthy of serious consideration. Videoconferencing as a recruiting tool offers the following advantages.

- **Decreased Logistics and Coordination; Reduced Time-To-Hire...**The use of videoconferencing provides an element of flexibility regarding the scheduling of interviews and internal HR meetings because not all required staff must be physically present in the same location on the same day. For example, a candidate can be directed to a public room in a certain city and can meet with four different corporate managers, all located in different cities, within a two-hour period of time. Without videoconferencing, such meetings would have required the candidate to visit the company several times or would have forced a delay in the interviewing process until all key staff happened to be available and in the same office. A streamlined interview and hiring process can help companies shorten time to hire, increase revenues per employee, and maximize their profits.
- **Increased Geographical Scope...** The use of videoconferencing may expand the potential labor pool of candidates under consideration. This is particularly effective if the employer is considering a candidate from another country or continent.
- **Saved Time and T&E Expenses...** Besides saving on the obvious airplane ticket and hotel expenses, videoconferencing enables the interviewer to avoid many of the costly and time-consuming niceties including the group dinners and lunches that typically accompany in-person meetings.
- **More Effective Interviews...**Videoconferencing can help companies improve the effectiveness of their interviewing process by allowing them to interview more candidates in a shorter period of time. In fact, in video-enabled HR departments, it is not uncommon for hiring managers to interview 10 or 15 different candidates for a single position in a single day.
- **Easy Archiving...**Videoconferencing lends itself easily to recorded interviews, enabling other managers to screen the candidate at their own convenience.

Some of the most-often factors that would need to be addressed in a Marketing plan include:

- *Travel Is Not Just An Activity, It Is A Behemoth* – A huge number of people work in the global travel industry. In addition, in most large companies, the resources working in the corporate travel department greatly outnumber those working in the videoconferencing support groups. In addition, the amount of money spent on corporate travel far exceeds that spent on videoconferencing. For these reasons, travel managers tend to hold more corporate clout than the video team, which has a strong impact on the corporate travel policies and the approval process for investments in videoconferencing.
- *Travel Is Not An Unknown* – Virtually all business people are personally familiar with the benefits of business travel. Either they themselves are business travelers, or their managers and colleagues are business travelers. However, the majority of

Montana Videoconferencing Strategic Plan

people have not participated in a videoconferencing meeting. Therefore, videoconferencing remains an uncomfortable unknown to many staff members.

- *Travel Is Both Business and Private* – Because of the relatively high cost of videoconferencing equipment and the necessary data lines, videoconferencing at this time is primarily a business only tool. However, travel translates easily into people's private lives. Thoughts of travel makes people think about their last, and perhaps their next vacation or opportunity to visit their friends and loved ones. In short, for many people travel is a part of a pleasant and personal event while videoconferencing is a part of work and business.
- *Travel Rewards Frequent Travelers* – In an effort to compensate inconvenienced travelers and to reward frequent customers, airlines and hotels often provide customers with gifts or rewards. These items of creative compensation include free trips, flight /seat upgrades, free hotel nights, discounts on future travel, and personal pampering such as entrance to business lounges. Videoconferencing, on the other hand, offers no such perks other than the knowledge that the individual is saving time and money.
- *The Travel Industry Understands Marketing* – The travel industry spends a great deal of money on marketing the benefits and fun involved in both personal and business travel. This marketing includes television ads, radio commercials, newspaper and magazine promotions, and more. This generates a great deal of awareness and helps existing and potential customers feel more comfortable initiating travel plans. The videoconferencing industry, on the other hand, is comprised of smaller companies that don't have the marketing budgets to aggressively promote their products and solutions.

Video vs. The Telephone

Virtually all users of videoconferencing agree that video meetings are more effective than telephone only conferences. As described previously, many support managers try to justify the investment in and use of videoconferencing by comparing video to the telephone. Unfortunately, initiating such a battle does not always yield positive results for some of the following reasons:

- *Massive Deployment* – In almost any country around the world, a person can buy a telephone quite inexpensively. Even the previously expensive wireless phones are now available for a fraction of their initial cost. This low cost and global availability has led to the massive deployment of telephones around the world. However, videoconferencing systems remain relatively expensive and therefore deployments to date have been limited. This means that even if a person or organization does invest in videoconferencing, it is possible (and even likely) that they will not be able to reach all of their business contacts via video. Sometimes called the "who are you going to call?" syndrome, this is not an issue with the telephone.

Montana Videoconferencing Strategic Plan

- *Everyone Is A User* – Thanks to a global and massive deployment, virtually everyone around the “civilized” world uses the telephone. This has led to a high level of comfort with the telephone, and leads people to choose the telephone as a primary communication tool.
- *Simple User Interface* – In its basic form, using a telephone involves only picking up the handset and dialing a telephone number. There are no menus to traverse, no options to select, and no configuration to complete. In fact, the telephone is a product you can use without even reading the user manual. However, using a videoconferencing system involves a series of menus and a variety of options and settings. In addition, a typical videoconferencing system ships with a long and complex user manual. This has slowed the deployment of video.
- *Phenomenal Reliability* – Telephone systems used by enterprise organizations and telephone companies offer an amazing level of reliability. Often called the five nines of reliability, these systems offer up to 99.999% up time and therefore it is quite rare that a telephone user cannot use their telephone. Videoconferencing, unfortunately, cannot match the reliability offered by the telephone. For this reason, people often avoid depending upon videoconferencing as a key business tool.
- *Low Usage Costs* – In the enterprise environment, it is not unusual for organizations to pay only 2 or 3 cents per minute for long distance telephone calls. This translates into an hourly usage cost of less than \$2. However, videoconferencing usage tends to be much more expensive because of the bandwidth required to complete a call. Although videoconferencing does offer many benefits that more than justify the additional expense, many users limit their comparison to investment and usage costs only.

Limited Experience

One of the most difficult challenges facing proponents of videoconferencing is the limited use and deployment depth of videoconferencing technology. Reasons for this include:

- *Travel's Benefits Are Clear* – Business travel has long been, and will likely remain a key part of everyday business. The benefit of having face-to-face contact with colleagues and other contacts combined with the excitement of new experiences, the “creative” perks (as described previously), and the break from the monotonous pace of the workplace prompts some executives to seek out travel opportunities. For these reasons, some people and even some organizations choose not to deploy videoconferencing regardless of the benefits it offers.
- *Lack of Awareness* – Videoconferencing departments inside organizations often do not have the resources to promote their solutions widely inside the enterprise, thereby limiting the exposure of videoconferencing throughout the user community and limiting the potential savings.

Montana Videoconferencing Strategic Plan

- *Convenience and Availability* – The multi-location nature of video meetings increases the complexity involved in coordinating a videoconference. In some organizations, reserving a video meeting requires several phone calls, faxes, e-mails, and follow-up activities to multiple support groups. However, a phone call requires little or no prior planning. In addition, the deployment depth of videoconferencing remains light in many companies. Therefore, even if a person wishes to reserve a videoconference, it is possible (and in some cases even likely) that a suitable room may not be available at a convenient time.
- *Limited Key Performance Indicators (KPIs)*. Decision makers within most organizations depend heavily upon cost-savings and payback calculations before making investment decisions. Unfortunately, most videoconferencing systems deployed today do not provide a record of call volume and usage. Since savings and payback calculations are derived from usage information, the only way to derive such figures is to manually track each and every use of the equipment and the realized savings. Because this would necessitate assigning additional staff, most organizations do not generate these manual statistics, and therefore, decision makers are not given the benefit of accurate hard benefit calculations.

Fortunately, videoconferencing system manufacturers have addressed this problem and current video systems do allow usage information to be downloaded and archived. Therefore, this issue should disappear in the next few years.

- *Too Many Soft Benefits* – As described previously, many (if not the majority) of the benefits offered by videoconferencing are soft benefits. These benefits include significant time savings, improved quality of life, and improved effectiveness of meetings. Such benefits, unfortunately, are difficult to quantify and therefore people tend to ignore or downplay the importance of these benefits when considering investments in video technology.
- *Approvers Don't Understand The Benefits*. In most organizations, only a small minority of executives have first-hand experience with videoconferencing. Therefore, it is likely that the managers and executives charged with approving requested investments in videoconferencing do not truly understand the benefits that such an investment would generate.
- *Relatively High Buy-In*. Unlike the telephone and business travel, organizations must make a fairly significant and long-term investment in videoconferencing technology before they can place even their first video call. Furthermore, the necessary investment often includes the hiring of specialized support personnel or re-deployment of existing internal resources. This high sticker price causes some companies to avoid videoconferencing.
- *Stress* - Because all participants can see each other during a video meeting, these meetings tend to be more directed, focused, and formal. Although this does improve efficiency, it can prove stressful to some people.

Montana Videoconferencing Strategic Plan

- *Video Can Be Uncomfortable* – During non-video meetings, attendees are not able to see themselves as others see them. However, during a videoconference, participants can always see themselves by using the preview or self-view function. Some people, and especially people who are not comfortable in front of any camera, find this self-view to be disconcerting and therefore are uncomfortable during video meetings.
- *Video's Troubled Past* - As discussed previously, videoconferencing meetings do not provide the level of reliability offered by the telephone. Unfortunately, many business executives have experienced videoconferencing problems first hand and still recall the resulting stress and embarrassment. Although these types of problems have become uncommon, there are people who were so significantly impacted by prior issues that they still avoid using videoconferencing. In addition, such people may influence others in their organization, especially their subordinates, to avoid using video.
- *Confidentiality Issues* – The benefits offered by videoconferencing makes it a logical choice for busy executives and critical meetings. However, the technologies required for a videoconference (cameras, microphones, etc.) cause some people to suspect that their meetings are being recorded or re-broadcast to non-participating parties. This leads some people to avoid using videoconferencing for confidential discussions, even when video would be the most cost-effective and efficient venue for the session.

A high-level financial analysis can be constructed using the following comparisons:

- General Travel Cost Considerations
 - # Travelers
 - Average cost per trip
 - # Meetings/month
 - Meeting length
 - Round trip travel time
 - Non-productive meeting time
 - Pre- and post-travel time
 - Annual Salary
 - Overhead % for benefits, etc.
- Videoconferencing Cost Considerations
 - # Video systems
 - Initial Cost
 - Annual Maintenance Costs
 - Management costs
 - Network costs
 - Bridging costs
 - % Meetings converted to videoconferencing

Montana Videoconferencing Strategic Plan

Appendix E.1 - Video Forum Small Group Comments

Notes from group reports at Video Forum, April 23, 2002

Group A

Uses

- Meetings
- Conferences
- Parent Conferences
- Employee Orientation
- Distance Learning
- DOT- portable usage- training/maintenance
- PC Video
- HR-Interviews
- Judges Meetings
 - Settlements
 - Sentence Review
- District/State Court transfer and uses
- Testimony to Legislature

Barriers

- Cost-hard to justify \$\$
- Not affordable
- Conference space in Helena
- Network issues border to border
- Effective systems-dependability-location
- Marketing

Pricing

- Legislative subsidy
- Fixed costs-guaranteed access
- Network costs-built in-separate video
- Subscriptions
- Integrate network connectivity costs
- Grants

Group B

Uses

- Distance Learning #1
- Staff Meetings
- Corrections Dept. Parole court
- Streaming video

Montana Videoconferencing Strategic Plan

Benefits

- Productivity
- Decreased travel costs- per diem, increased productivity, time saving extended access to resources.
- Reduced geographic barriers
- Uniform delivery of content to sites
- Worldwide communications
- Access to resources
- Uniform delivery of content
- Training frequency

Obstacles

- Funding-budget often specified for specific purpose and can't be allocated
- Limited resolution of images
- Lack of support –administrative and technical and staffing

Pricing Suggestions

- Privatize the whole thing-level of service suffer? Cost less?
- Offer level of service support
- Legislative money-Investment of money is a large impediment
- Tiered pricing
- Volume discount-a pricing structure that is EASY to understand
- Easy pricing
- Propose a team for grant funding to expand services

Group C Education dominated group

Uses

- Distance learning or instruction
 - K-12 also
- Bring in expertise and program you don't have
- Community college non-traditional students
- Guest speakers
- Virtual incubator
- Student collaboration
- HR-Interviews
- Grant administration
- National group board meetings
- Grant administration collaboration between schools and other entities

Costs

- Flat fees penalize heavy users (DB comment- seems backwards)
- When using room pay the techs on the side
- Can't recapture investment costs to update and upgrade
- Discounted rate for institutions

Montana Videoconferencing Strategic Plan

Group D Business Services Division

Uses

- License boards-board member's 33 boards meet 1 or 2 or 6 x year
 - 3-11 members throughout state
 - Small budgets
 - Sub-committees
 - Ad-hoc committees
 - Consumer (or licensee complaints)
 - Discipline hearings
 - Expert witnesses from out of state
- Continuing education-sometimes bring in out of state trainers
- Public access to rule making
- Training of building inspectors
- Local government services

Obstacles

- Costs born by licensees for current services
- Costs per hour better or tiered rate schedule –Flat rate +hour rate
- Confidentiality
- Cost vs. travel-Board members would still have to travel
- Location-availability-**parking**
- Priority of University system having scheduling year in advance, but other clients can only get into schedule 90 days in advance, and scheduling rooms and speakers that close is hard to do.

Pricing

Volume agreement

Montana Videoconferencing Strategic Plan

Appendix F.1 - Comparison of ISDN and IP for Videoconferencing

Summarized from a study by Wainhouse Research

	ISDN Legacy Solution	IP-Based Solution
Data Network	Separate network required	Can use existing packet switched IP data network
Data Line Deployment	ISDN lines were (and are) problematic to deploy	IP data lines (LAN drops) are easy to deploy
Usage Fees	Expensive per minute usage fees.	Inexpensive, or even no usage fees, depending upon deployed data lines
Security	Limited when carried across public networks	High when used with private networks such as SummitNet II
Reliability	Low due to the need to bond several ISDN data lines	High due to the reliability of IP networks and the skill of network support staff.
Audio and Video Quality	Limited by relatively low available bandwidth	Higher thanks to additional bandwidth
Remote Management	Limited	Standard
Call Control	Limited	Extensive through the use of gatekeepers and remote management systems.
Scalability Within the enterprise	Low – limited by system cost and availability of ISDN	High – low cost and high availability of IP bandwidth
Fault Management	Difficult when multiple carriers are used	Easy – uses standard network management tools

Montana Videoconferencing Strategic Plan

Appendix G.1 - MCU Feature Comparison

Standard or Feature	Accord MCG-50	Accord MCG-100	Avaya MCU CX	Avaya MCU DX	Ezenia Series 2000	Ezenia Encounter 1000	Ezenia Encounter 3000	RADVision MCU-323	RADVision ViaIP
H.320	X	X	X	X	X	?	X		X
H.323	X	X		X		X	X	X	X
T.120	X	X	X	X	X	X	X	X (external server)	X
Audio Transcoding	G.722/G.711/G.728/G.723	G.722/G.711/G.728/G.723	G.722/G.711	G.722/G.711	G.722/G.711	G.711/G.723	G.722/G.711/G.723	G.711/G.723 G.711/G.729	G.711/G.723 G.711/G.729
Video Transcoding	X	X	X	X	X				X
Voice Activated Switching	X	X	X	X	X	X	X	X	X
Continuous Presence Quad Split	X	X	X	X	X	X	X	X	X
Continuous Presence Other Layouts	X	X	X	X	X				
Cascading Allowed	X	X	X	X	X	X	X	X	X
Scheduling Software Web Accessible	X	X	X	X		X	X	X	X
Cost	Depending on option package \$35,000 and up	Depending on option package				8 user \$3995	16 user \$23,500 24 user \$31,500	\$19,950	Depending on option package \$45,000 and up

Montana Videoconferencing Strategic Plan

Appendix H.1 - Scheduling and Management Software Vendor Comparison

Vendor Name	Product Name	Operability	Features	Estimated Costs	States Using	Other notes	Server Requirements	Est. Server Costs – HW and SW
Todd Video Network Management, Inc.	TC Reliance	Open system architecture	Administration Automation and scheduling Web GUI	\$34,000 Single MCU based system base price +15% installation +13% software maintenance +\$5k training	ND, SD, NB, KS, MO, IA	Can partition web-based interface to allow different client confidentiality	Windows NT 4.0 and Oracle	Included
Magicsoft	VC Wizard	Open system architecture	Calendar and scheduling Network administration	Base scheduler \$20k Device controller/MCU port \$ 750 \$ 500 per end device Maintenance is \$4k/year	OH	Microsoft Outlook interface	Windows NT 4.0 or Windows 2000	Included
Forgent	Video Network Platform	Open system architecture	Call management Network management	\$35k for 0-50 devices \$7k/year Maintenance \$6k for Installation/train	None known	Fairly new product	Windows NT 4.0 or Windows 2000	Included
Polycom	Global Management System + Path Navigator	Designed around Polycom units and bridge	Network management Global directory Software upgrades Account management	\$4,999 for 25 - 99 Sites \$9,999 for up to 100 sites \$24,999 for up to 500 sites	US Navy	Design developing- Now end unit management, working on integrated gatekeeper and MCU management	Windows NT 4.0 or Windows 2000	\$1,200
Tandberg	Tandberg Management System	Designed for Tandberg CODECs	Scheduling SW upgrades Global directory Fast restoration Templates Statistics and event notification Billing information Passwords and security	Free for first three sites \$1,500 for 10-50 \$7,500 for 50-100 \$10,000 for 101-200 \$30,000 for 201-500	None known	Supports Tandberg end-points	Windows NT 4.0 or Windows 2000	\$1,200

Montana Videoconferencing Strategic Plan

Appendix I.1 - MDT Locations with Comparative ATM Hub Locations

Use		Address	Town	Nearest VN ATM Hub	Nearest Summit Net ATM Hub	Current Speed	Closest METNET Site	Closest VisionNet Site
MDT Main Office		2701 Prospect Ave.	Helena	Helena	Helena	45MB	Helena DOT	1084 Helena Ave
MDT Area Office		1620 Airport Road	Lewiston	Great Falls	Great Falls	T1	MSU College of Technology	College of Technology
MDT Area Office		1671 Hwy 2 West	Havre	Havre	Havre	T1	MSU Northern	MSU Northern
MDT Area Office		217 N. 4th	Miles City	Miles City	Miles City	T1	Miles Community College	None Listed
MDT Area Office		85 5th Ave. N. E.	Kalispell	Future-Kalispell Existing-Missoula	Kalispell	T1	Flathead Valley Community College	None Listed
MDT Area Office		907 N. Rouse Ave.	Bozeman	Bozeman	Bozeman	T1	No location	MSU
MDT Area Office		Hwy 25 East, HC31	Wolf Point	Glasgow-48 mi	Miles City-172 mi	T1	Miles Community College	None Listed
MDT District Office		104 18th Ave. N.E.	Great Falls	Great Falls	Great Falls	T1	MSU College of Technology	MSU College of Technology
MDT District Office		2100 W. Broadway	Missoula	Missoula	Missoula	T1	University of Montana	1221 N. Russell Road
MDT District Office		3751 Wynne Ave.	Butte	Future-Butte Existing-Helena	Butte	T1	Montana Tech of U of M	None Listed
MDT District Office		424 Morey St.	Billings	Billings	Billings	T1	MSU/Billings	MSU - Billings
MDT District Office		503 N. River Ave.	Glendive	Glendive	Miles City-78 mi	T1	Miles Community College	None Listed

Key



SummitNet II and Vision Net ATM hub in the same community

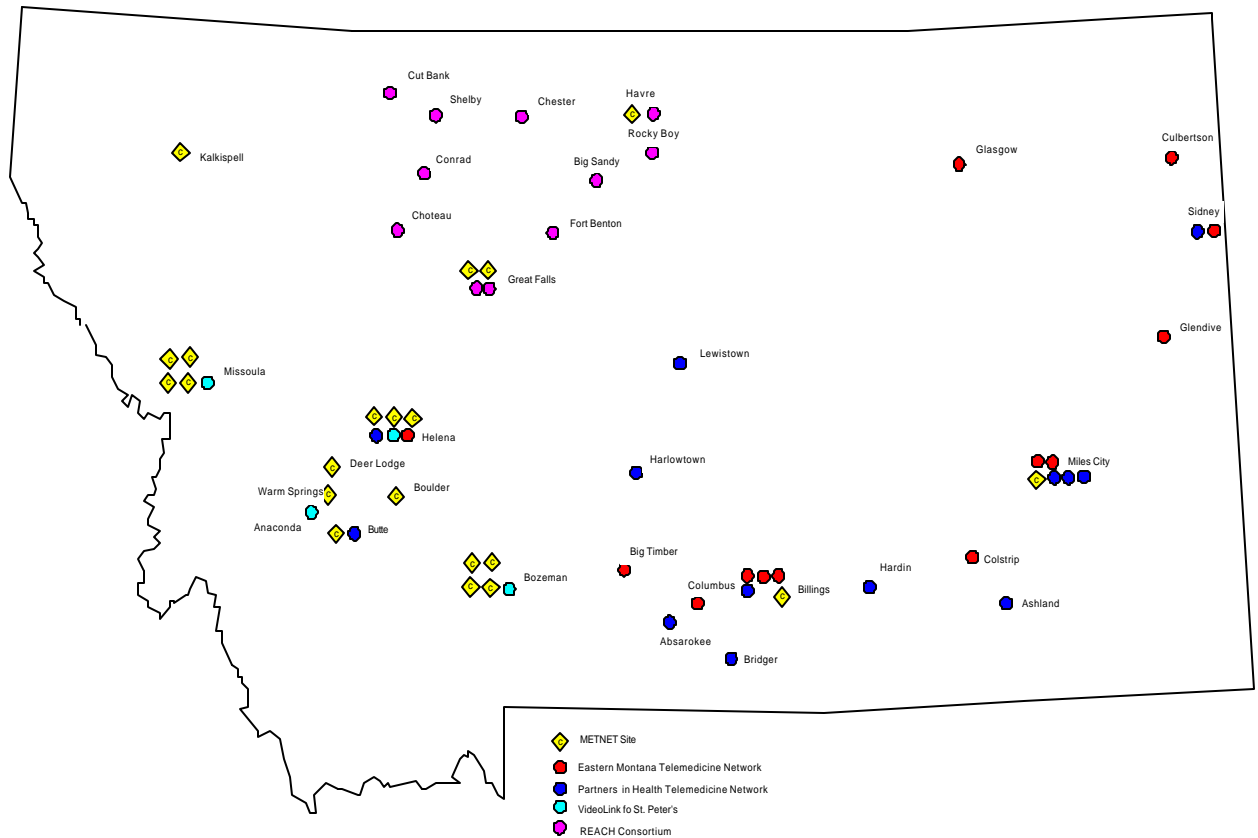
No SummitNet II or Vision Net ATM hub in community

SummitNet II ATM hub in community; no Vision Net hub

Vision Net ATM hub in community; no SummitNet II ATM hub

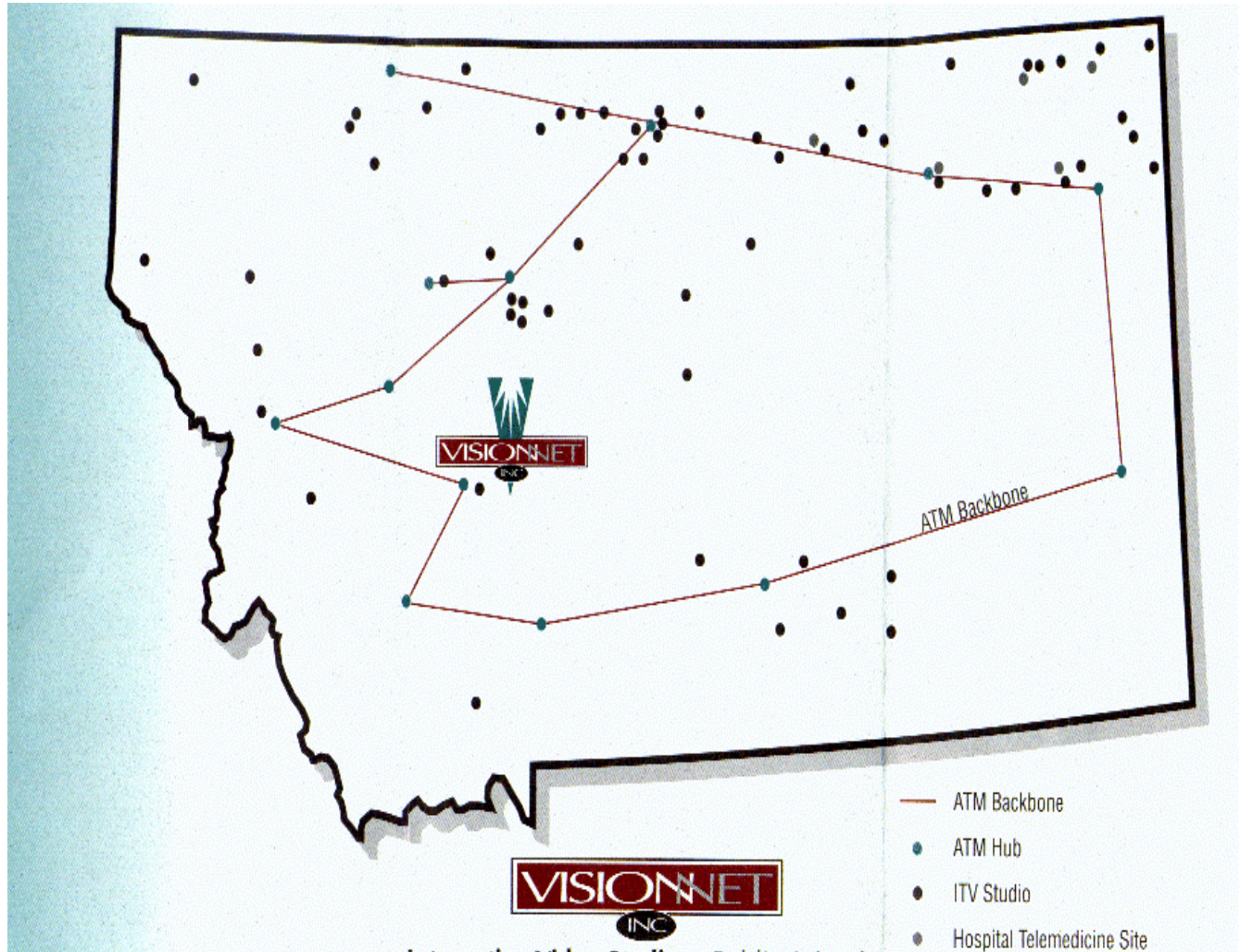
Montana Videoconferencing Strategic Plan

Appendix J.1 - Non-Profit Videoconferencing Providers in Montana



Montana Videoconferencing Strategic Plan

Appendix J.2 - Vision Net Videoconferencing Coverage in Montana



Montana Videoconferencing Strategic Plan

Appendix K.1 - Considerations for Outsourcing Decisions

Once the decision to outsource is made, there are several key issues to consider when evaluating the potential outsourcing partner. These would normally be a part of the formal evaluation process. The three primary issues to consider are financial stability, scope, and flexibility.

Financial stability refers to the ability of the firm to be a long-term player and have strong control over its ownership structure. Things to look for include a strong balance sheet and consistently strong cash flows. The meltdown of service providers has been a learning lesson for those who did not include this factor. Further, the ROI of the project should be carefully forecasted and should be in line with the other financial goals of the organization. Constant monitoring of progress towards this goal will help insure that critical issues are raised as early as possible.

Scope of services refers to the breadth and depth of products and services offered. A vendor should have excellent good customer references on comparable arrangements to show that they walk their talk. Many of the emerging providers don't have the depth of skills or the experience to take on a broad spectrum of operations. This includes the skills of the organization (get specific in terms of defining exactly who will be working on the engagement, particularly for critical technical positions as well as for the overall engagement manager). Technology solutions tend to be largely undifferentiated. The real discriminator in technology is whether a company and its employees can keep pace with rapid technological changes — at this point in the world of videoconferencing, it is a great opportunity for a service provider to bring these talents to bear.

Flexibility is critical given the amount of change in the public sector for both client services and well as for their internal use of technologies and systems. It's very difficult to engage in a long term (4-6 years) contract without major changes being required. Amendments and addendums are difficult enough even with the most flexible partnerships. Having alignment on your overall goals with the provider is important in making a relationship successful over the long term. A robust due diligence process should be undertaken for the preferred provider, including visiting references, and comparing promises to what is delivered from both a services as well as a financial standpoint. While mapping cultures between public and private sector organizations can be a special challenge, it is critical that both the client and the service provider have a strong advocate for the relationship at a highly visible level of the organization. Both must be committed to creating and sustaining a true "win-win" relationship.

While many service providers purport to be great innovators in technology development and use, in fact most problems are usually resolved by a relatively small set of tools. It is usually only in process development and execution that service providers can be truly innovative. The ability of a service provider to show this innovation in its processes is a critical variable to assess.

Montana Videoconferencing Strategic Plan

Another part of this is to clearly define the exit strategy up front, particularly when governments are subject to non-negotiable budget reductions or legislative mandates. Governments can expect to see some treatment of a risk premium built into the outsourcer's financial model to cover this possibility.

Active communications with stakeholders (clients and employees) is critical during all phases of the relationship. In many cases, subject to labor agreements and other legal constraints, employees currently performing work functions affected by the outsourcing arrangement may be transferred to the service provider. This provides for good knowledge transfer and can often offer greater career development and mobility options for the affected employees. The interpersonal challenges can often be more significant than the process or technology issues.

Organizations who engage in outsourcing should insure that strong supplier management processes and SLAs are in place. For videoconferencing, these might include:

- Percentage of calls delivered as scheduled
- Number of defects in the use of technology (minutes of network outage, minutes of equipment downtime, etc.)
- Client satisfaction levels based on surveys or web-based feedback instruments
- Accuracy and timeliness of billing and adjustments
- Cycle time metrics for network and equipment procurement, installation, and maintenance

Many organizations look to outsource their technology infrastructure first, followed by selected parts of their business process infrastructure. This can work well in situations where the business processes are not tightly coupled to the technologies. Open platforms and use of industry standards help facilitate this as well as making the exit strategy easier to implement.

Montana Videoconferencing Strategic Plan

Appendix L.1 - METNET Site Upgrade Cost Estimate

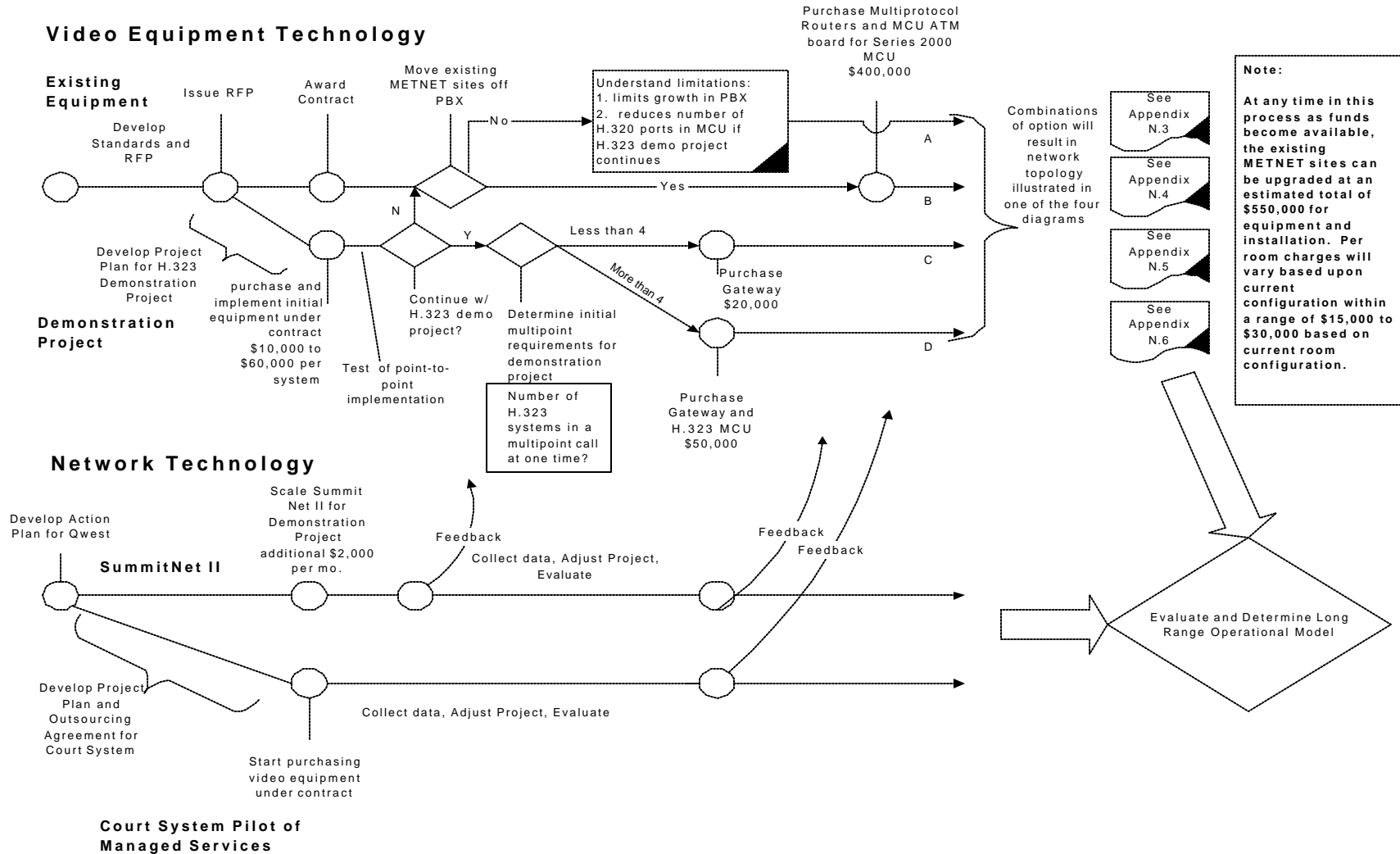
Location Name	Actual Location	CODEC	Qty to Replace	Camera	Qty to Replace	Control System	Qty to Replace	Doc Camera	Qty to Replace
BMT	Butte	Vtel LC-3200	1	SyEVI-D30		Vtel ESA	1	EV-308	
DOT	Department of Transportation Helena	PictureTel 4500	1	PictureTel	1				
DPH	Helena DPHHS	CLI 8875	1	CLISony	2	CLI-AMX	1	EV-308	
EMC	Eastern Montana College Billings	Vtel LC-3200	1	SyEVI-D30		Vtel ESA	1	EV-308	
FVC	Flathead Valley Community College	Vtel LC-3200	1	SyEVI-D30		Vtel ESA	1	EV-308	
GC2	Great Falls	Vtel LC-5000	1	SyEVI-D30		Vtel ESA	1	EV-368	
GTC	Great Falls	Vtel LC-3200	1	SyEVI-D30		Vtel ESA	1	EV-308	
HCT	Helena College of Technology	Vtel LC-3200	1	SyEVI-D30		Vtel ESA	1	EV-308	
MCC	Miles City College	CLI G225	1	Hitachi KP-501	2	AMX	1	EV-308	
MDC	Boulder	CLI8750	1	CLI	1	CLI-AMX	1		
ME8	MSU Burns Center	Vtel TC2000	1	SyEVI-D30		Vtel ESA	1	EV-400AF	
MSP	Deer Lodge Prison	CLI 8750	1	CLI	1	CLI-AMX	1		
MSU Tech Link	MSU Bozeman - Private	Vtel 2500	1	EVI-D30		Vtel	1		
MSU103	Montana State University	CLI-8700	1	SyDXC950		Crestron	1	AF-400	
MSU126	Montana State University	CLI8700	1	CLI	2	CLI-AMX	1	EV-368	
NMC	Northern Montana College Havre	CLI9075	1	CLISony	2	CLI-AMX	1	EV-308	
UCE	University of Montana-Continuing Ed	Vtel LC5000	1	SyEVI-D30		Vtel ESA	1	EV-400AF	
UOM	University of Montana Room 104	CLI8875	1	CLISony	2	CLI-AMX	1	EV-308	
UOM106	University of Montana	CLI-RII/VP	1	SYDXC930		AMX-Custom		EV-368	
UOM108	University of Montana	CLI-RII/VP	1	SYDXC930		AMX-Custom		EV-308	
WMC	Dillon	CLI-9075	1	CLISony	2	CLI-AMX	1	EV-308	
WSH	Warm Springs State Hospital	CLI 8750	1	CLI	1	CLI-AMX	1	CLI	1

Montana Videoconferencing Strategic Plan

METNET SITE UPGRADE COST ESTIMATE									
	Totals		22		16		19		1
	Estimated cost per site		CODEC		Camera		Control System		Doc Camera
			\$ 10,500		\$ 1,100		\$ 9,000		\$ 2,500
	Total all sites		\$231,000		\$17,600		\$171,000		\$2,500
							Overall Total		\$422,100
							Estimated Installation		\$126,630
							Estimated total		\$548,730

Montana Videoconferencing Strategic Plan

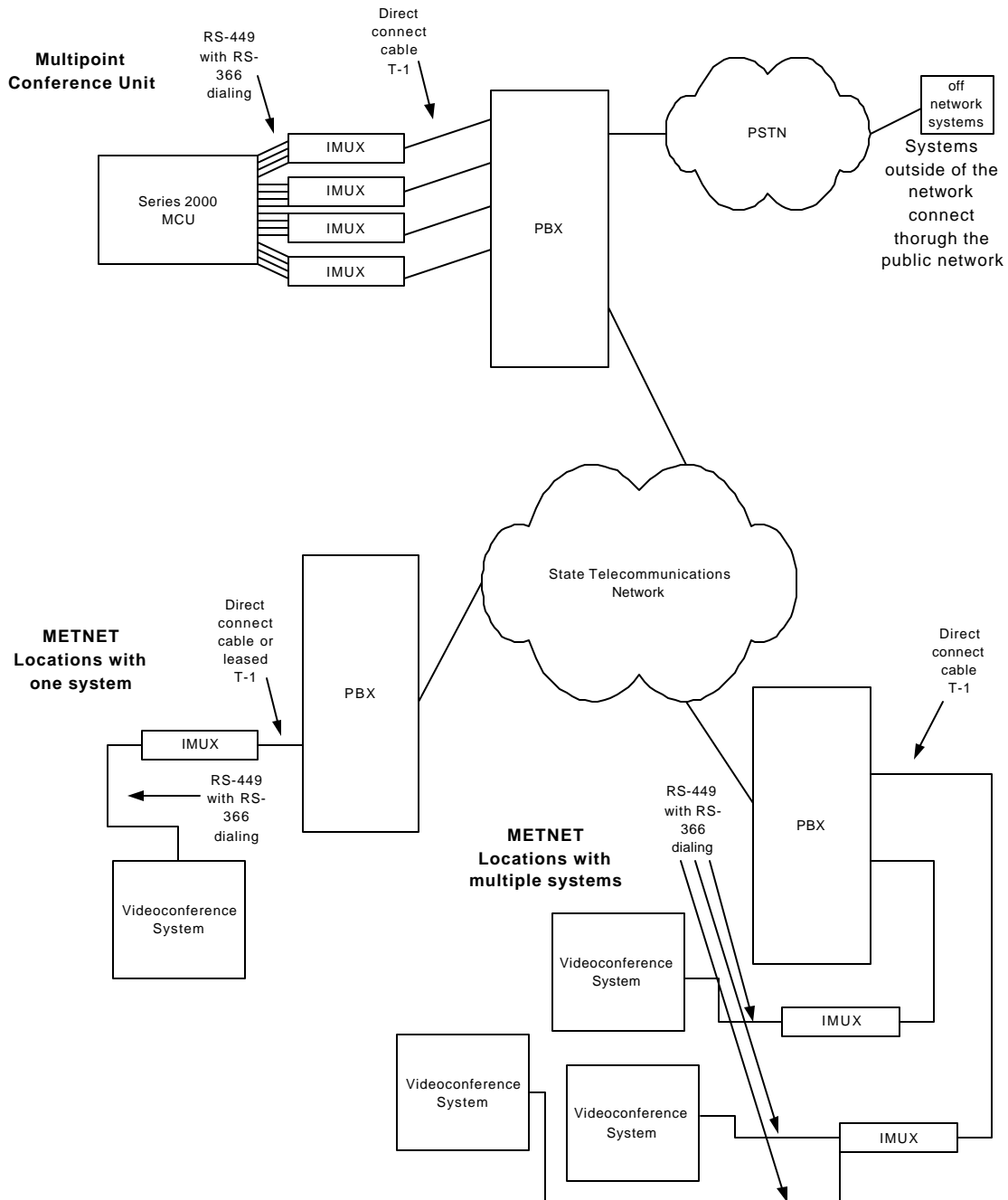
Appendix M.1 – Implementation Process



Montana Videoconferencing Strategic Plan

Appendix N.1 – Current METNET configuration

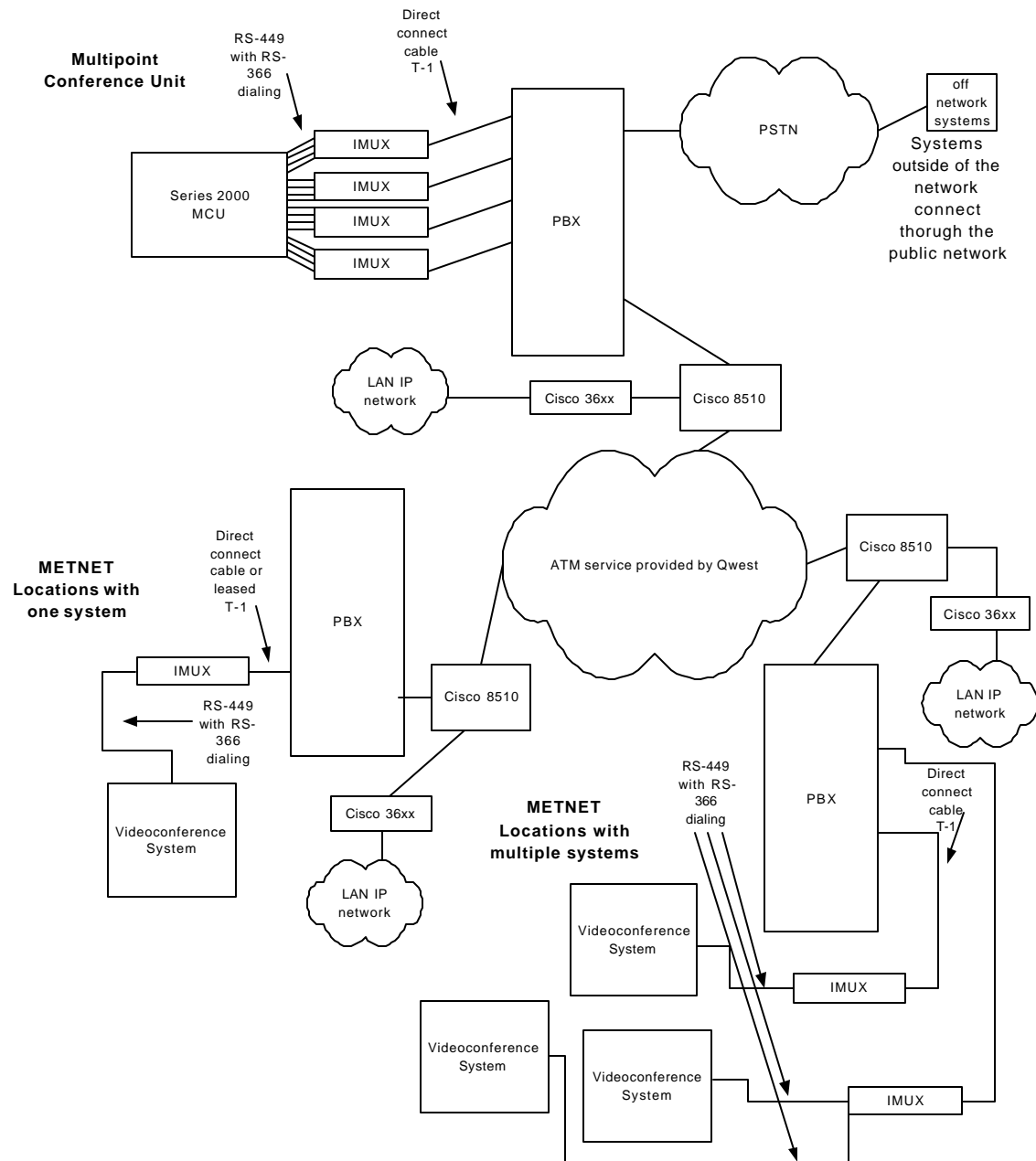
Current Configuration for Video Over the State Telecommunications Network



Montana Videoconferencing Strategic Plan

Appendix N.2 – Current Migration Plan

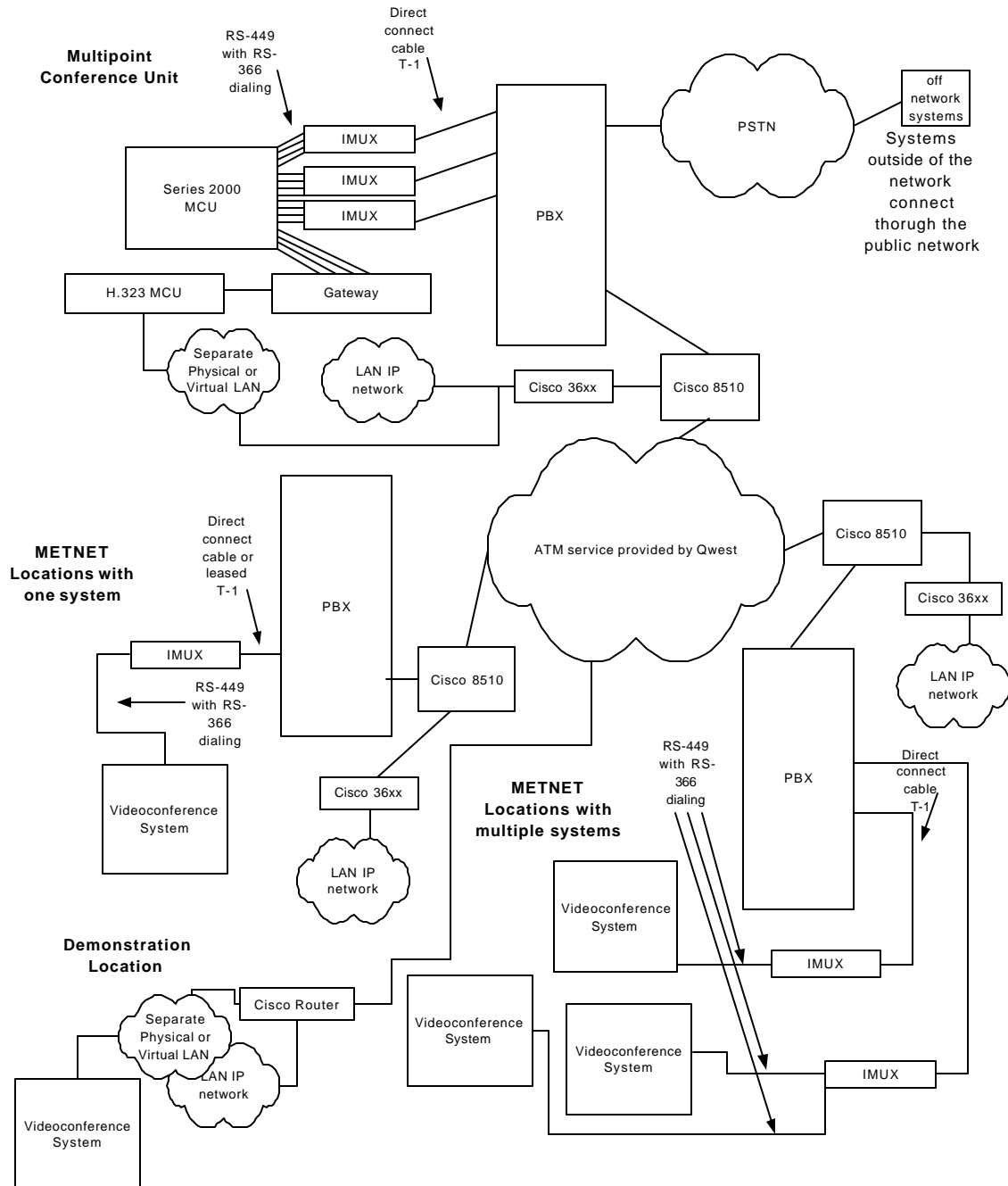
Current Migration Plan Video Over the Summit Net II



Montana Videoconferencing Strategic Plan

Appendix N.4 – Bridging, 5+ sites, on PBX

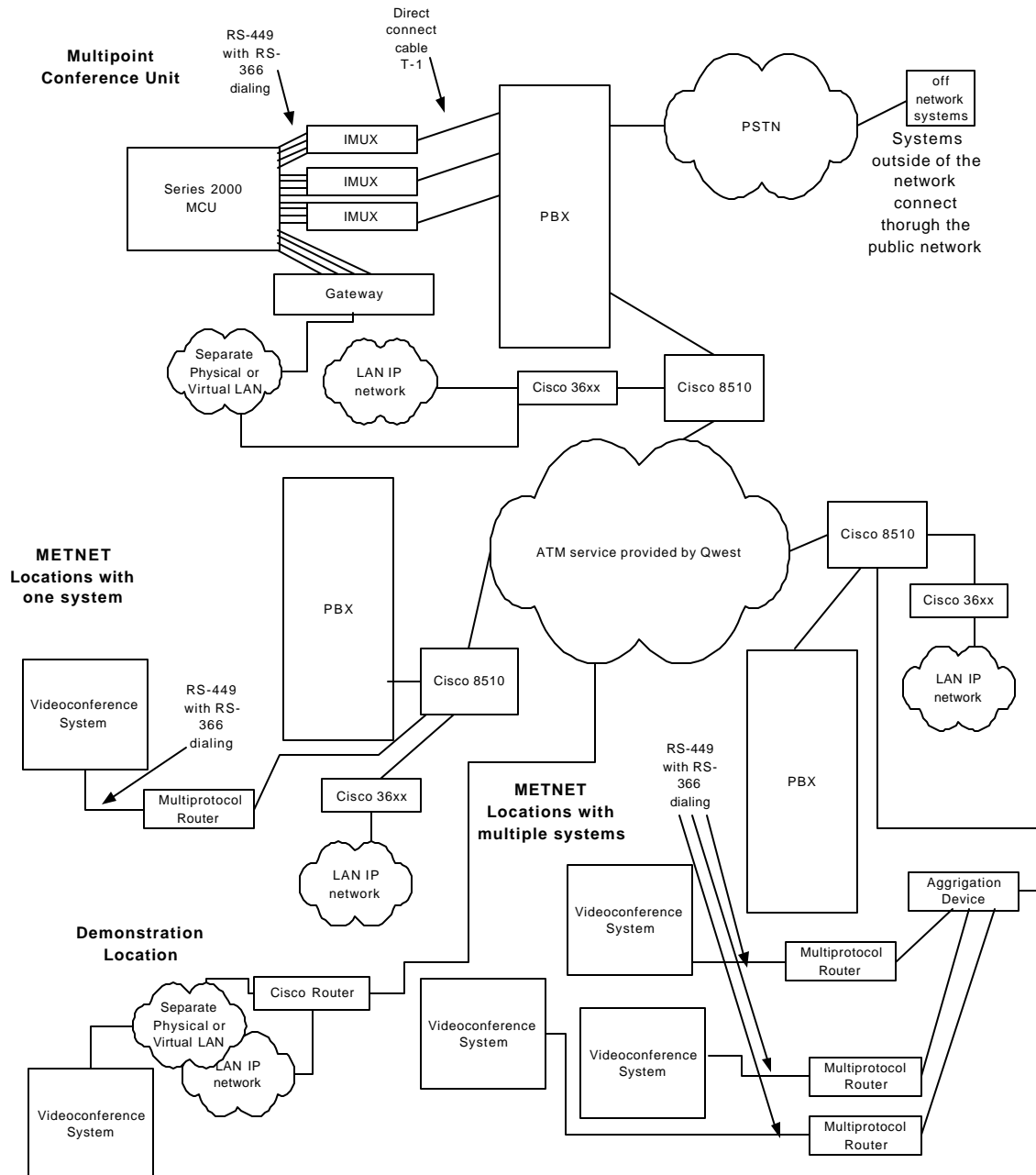
Plan to Add Bridging Capabilities for More than Four Demonstration Sites And Leave METNET Sites on PBX



Montana Videoconferencing Strategic Plan

Appendix N.5 – Bridging, <5 sites, off PBX

Plan to Add Bridging Capabilities for Four or Fewer MDT Demonstration Sites And Move METNET Sites off PBX



Montana Videoconferencing Strategic Plan

Appendix N.6 – Bridging, 5+ sites, off PBX

Plan to Add Bridging Capabilities for More than Four
Demonstration Sites And Move METNET Sites off PBX

